

No-Code Technician License Examination Question Pool

For tests given after July 1, 2003

*With the questions arranged in the order of how they're
covered in the W8BBS study guide*

Introduction

T1A01 Who makes and enforces the rules for the amateur service in the United States?

- A. The Congress of the United States
- B. The Federal Communications Commission (FCC)
- C. The Volunteer Examiner Coordinators (VECs)
- D. The Federal Bureau of Investigation (FBI)

T1A03 What is the definition of an amateur station?

- A. A radio station in a public radio service used for radiocommunications
- B. A radio station using radiocommunications for a commercial purpose
- C. A radio station using equipment for training new broadcast operators and technicians
- D. A radio station in the amateur service used for radiocommunications

T1A02 What are two of the five fundamental purposes for the amateur service in the United States?

- A. To protect historical radio data, and help the public understand radio history
- B. To help foreign countries improve communication and technical skills, and encourage visits from foreign hams
- C. To modernize radio schematic drawings, and increase the pool of electrical drafting people
- D. To increase the number of trained radio operators and electronics experts, and improve international goodwill

T1D03 What government agency grants your amateur radio license?

- A. The Department of Defense
- B. The State Licensing Bureau
- C. The Department of Commerce
- D. The Federal Communications Commission

T1C01 Which of the following is required before you can operate an amateur station in the US?

- A. You must hold an FCC operator's training permit for a licensed radio station
- B. You must submit an FCC Form 605 together with a license examination fee
- C. The FCC must grant you an amateur operator/primary station license
- D. The FCC must issue you a Certificate of Successful Completion of Amateur Training

T1C08 Where does a US amateur license allow you to operate?

- A. Anywhere in the world
- B. Wherever the amateur service is regulated by the FCC
- C. Within 50 km of your primary station location
- D. Only at the mailing address printed on your license

T4B09 When is the FCC allowed to conduct an inspection of your amateur station?

- A. Only on weekends
- B. At any time
- C. Never, the FCC does not inspect stations
- D. Only during daylight hours

T1C02 What are the US amateur operator licenses that a new amateur might earn?

- A. Novice, Technician, General, Advanced
- B. Technician, Technician Plus, General, Advanced
- C. Novice, Technician Plus, General, Advanced
- D. Technician, Technician with Morse code, General, Amateur Extra

T1D06 What is a Volunteer Examiner (VE)?

- A. A certified instructor who volunteers to examine amateur teaching manuals
- B. An FCC employee who accredits volunteers to administer amateur license exams
- C. An amateur, accredited by one or more VECs, who volunteers to administer amateur license exams
- D. An amateur, registered with the Electronic Industries Association, who volunteers to examine amateur station equipment

T1D07 What minimum examinations must you pass for a Technician amateur license?

- A. A written exam, Element 1 and a 5 WPM code exam, Element 2
- B. A 5 WPM code exam, Element 1 and a written exam, Element 3
- C. A single 35 question multiple choice written exam, Element 2
- D. A written exam, Element 2 and a 5 WPM code exam, Element 4

T1D04 What element credit is earned by passing the Technician class written examination?

- A. Element 1
- B. Element 2
- C. Element 3
- D. Element 4

T1D01 Who can become an amateur licensee in the US?

- A. Anyone except a representative of a foreign government
- B. Only a citizen of the United States
- C. Anyone except an employee of the US government
- D. Anyone

T1D02 What age must you be to hold an amateur license?

- A. 14 years or older
- B. 18 years or older
- C. 70 years or younger
- D. There are no age limits

T1C03 How soon after you pass the examination elements required for your first Amateur Radio license may you transmit?

- A. Immediately
- B. 30 days after the test date
- C. As soon as the FCC grants you a license and the data appears in the FCC's ULS data base
- D. As soon as you receive your license from the FCC

T1C05 What is the normal term for an amateur station license grant?

- A. 5 years
- B. 7 years
- C. 10 years
- D. For the lifetime of the licensee

T1C04 How soon before the expiration date of your license may you send the FCC a completed Form 605 or file with the Universal Licensing System on the World Wide Web for a renewal?

- A. No more than 90 days
- B. No more than 30 days
- C. Within 6 to 9 months
- D. Within 6 months to a year

T1C11 If you forget to renew your amateur license and it expires, may you continue to transmit?

- A. No, transmitting is not allowed
- B. Yes, but only if you identify using the suffix "GP"
- C. Yes, but only during authorized nets
- D. Yes, any time for up to two years (the "grace period" for renewal)

T1C06 What is the "grace period" during which the FCC will renew an expired 10-year license?

- A. 2 years
- B. 5 years
- C. 10 years
- D. There is no grace period

T8F14 What is the minimum FCC certification required for an amateur radio operator to build or modify their own transmitting equipment?

- A. A First-Class Radio Repair License
- B. A Technician class license
- C. A General class license
- D. An Amateur Extra class license

T5A04 Where will you find a detailed list of your operating privileges?

- A. In the OET Bulletin 65 Index
- B. In FCC Part 97
- C. In your equipment's operating instructions
- D. In Part 15 of the Code of Federal Regulations

T1D09 What is the purpose of the Element 1 examination?

- A. To test Morse code comprehension at 5 words-per-minute
- B. To test knowledge of block diagrams
- C. To test antenna-building skills
- D. To test knowledge of rules and regulations

T1D08 How may an Element 1 exam be administered to an applicant with a physical disability?

- A. It may be skipped if a doctor signs a statement saying the applicant is too disabled to pass the exam
- B. By holding an open book exam
- C. By lowering the exam's pass rate to 50 percent correct
- D. By using a vibrating surface or flashing light

T1D05 If you are a Technician licensee who has passed a Morse code exam, what is one document you can use to prove that you are authorized to use certain amateur frequencies below 30 MHz?

- A. A certificate from the FCC showing that you have notified them that you will be using the HF bands
- B. A certificate showing that you have attended a class in HF communications
- C. A Certificate of Successful Completion of Examination showing that you have passed a Morse code exam
- D. No special proof is required

T1D10 If a Technician class licensee passes only the 5 words-per-minute Morse code test at an exam session, how long will this credit be valid for license upgrade purposes?

- A. 365 days
- B. Until the current license expires
- C. Indefinitely
- D. Until two years following the expiration of the current license

Basic Electronics

Electricity

T7A01 What is the name for the flow of electrons in an electric circuit?

- A. Voltage
- B. Resistance
- C. Capacitance
- D. Current

T7C01 Which of the following lists include three good electrical conductors?

- A. Copper, gold, mica
- B. Gold, silver, wood
- C. Gold, silver, aluminum
- D. Copper, aluminum, paper

T7A05 What is the basic unit of electric current?

- A. The volt
- B. The watt
- C. The ampere
- D. The ohm

T8F05 Which instrument would you use to measure electric current?

- A. An ohmmeter
- B. A wavemeter
- C. A voltmeter
- D. An ammeter

T7A02 What is the name of a current that flows only in one direction?

- A. An alternating current
- B. A direct current
- C. A normal current
- D. A smooth current

T7A03 What is the name of a current that flows back and forth, first in one direction, then in the opposite direction?

- A. An alternating current
- B. A direct current
- C. A rough current
- D. A steady state current

T8F01 Which instrument would you use to measure electric potential or electromotive force?

- A. An ammeter
- B. A voltmeter
- C. A wavemeter
- D. An ohmmeter

T7A06 How much voltage does an automobile battery usually supply?

- A. About 12 volts
- B. About 30 volts
- C. About 120 volts
- D. About 240 volts

T7A07 What limits the current that flows through a circuit for a particular applied DC voltage?

- A. Reliance
- B. Reactance
- C. Saturation
- D. Resistance

T7C02 What is one reason resistors are used in electronic circuits?

- A. To block the flow of direct current while allowing alternating current to pass
- B. To block the flow of alternating current while allowing direct current to pass
- C. To increase the voltage of the circuit
- D. To control the amount of current that flows for a particular applied voltage

T7A08 What is the basic unit of resistance?

- A. The volt
- B. The watt
- C. The ampere
- D. The ohm

T8F06 What test instrument would be useful to measure DC resistance?

- A. An oscilloscope
- B. A spectrum analyzer
- C. A noise bridge
- D. An ohmmeter

T7C03 If two resistors are connected in series, what is their total resistance?

- A. The difference between the individual resistor values
- B. Always less than the value of either resistor
- C. The product of the individual resistor values
- D. The sum of the individual resistor values

T7A04 What is the basic unit of electrical power?

- A. The ohm B. The watt C. The volt D. The ampere

T8F19 In Figure T8-9, what circuit quantity would meter B indicate?

- A. The voltage across the resistor B. The power consumed by the resistor
C. The power factor of the resistor D. The current flowing through the resistor

T8F04 How is an ammeter usually connected to a circuit under test?

- A. In series with the circuit B. In parallel with the circuit
C. In quadrature with the circuit D. In phase with the circuit

T8F20 In Figure T8-9, what circuit quantity is meter A reading?

- A. Battery current B. Battery voltage C. Battery power D. Battery current polarity

T8F02 How is a voltmeter usually connected to a circuit under test?

- A. In series with the circuit B. In parallel with the circuit
C. In quadrature with the circuit D. In phase with the circuit

T8F21 In Figure T8-9, how would the power consumed by the resistor be calculated?

- A. Multiply the value of the resistor times the square of the reading of meter B
B. Multiply the value of the resistor times the reading of meter B
C. Multiply the reading of meter A times the value of the resistor
D. Multiply the value of the resistor times the square root of the reading of meter B

Multimeters

T8F07 What might damage a multimeter that uses a moving-needle meter?

- A. Measuring a voltage much smaller than the maximum for the chosen scale
B. Leaving the meter in the milliamps position overnight
C. Measuring voltage when using the ohms setting
D. Not allowing it to warm up properly

T8F08 For which of the following measurements would you normally use a multimeter?

- A. SWR and power B. Resistance, capacitance and inductance
C. Resistance and reactance D. Voltage, current and resistance

T8F03 What happens inside a voltmeter when you switch it from a lower to a higher voltage range?

- A. Resistance is added in series with the meter B. Resistance is added in parallel with the meter
C. Resistance is reduced in series with the meter D. Resistance is reduced in parallel with the meter

Ohm's Law

T7A12 What formula shows how voltage, current and resistance relate to each other in an electric circuit?

- A. Ohm's Law B. Kirchhoff's Law C. Ampere's Law D. Tesla's Law

T7A13 If a current of 2 amperes flows through a 50-ohm resistor, what is the voltage across the resistor?

- A. 25 volts B. 52 volts C. 100 volts D. 200 volts

T7A14 If a 100-ohm resistor is connected to 200 volts, what is the current through the resistor?

- A. 1 ampere B. 2 amperes C. 300 amperes D. 20,000 amperes

T7A15 If a current of 3 amperes flows through a resistor connected to 90 volts, what is the resistance?

- A. 3 ohms B. 30 ohms C. 93 ohms D. 270 ohms

Capacitors

T7C07 Which of the following best describes a variable capacitor?

- A. A set of fixed capacitors whose connections can be varied
- B. Two sets of insulating plates separated by a conductor, which can be varied in distance from each other
- C. A set of capacitors connected in a series-parallel circuit
- D. Two sets of rotating conducting plates separated by an insulator, which can be varied in surface area exposed to each other

T7C04 What is one reason capacitors are used in electronic circuits?

- A. To block the flow of direct current while allowing alternating current to pass
- B. To block the flow of alternating current while allowing direct current to pass
- C. To change the time constant of the applied voltage
- D. To change alternating current to direct current

T7C06 What does a capacitor do?

- A. It stores energy electrochemically and opposes a change in current
- B. It stores energy electrostatically and opposes a change in voltage
- C. It stores energy electromagnetically and opposes a change in current
- D. It stores energy electromechanically and opposes a change in voltage

T0A11 Why would it be unwise to touch an ungrounded terminal of a high voltage capacitor even if it's not in an energized circuit?

- A. You could damage the capacitor's dielectric material
- B. A residual charge on the capacitor could cause interference to others
- C. You could damage the capacitor by causing an electrostatic discharge
- D. You could receive a shock from a residual stored charge

T7A10 What is the basic unit of capacitance?

- A. The farad
- B. The ohm
- C. The volt
- D. The henry

T7C05 If two equal-value capacitors are connected in parallel, what is their total capacitance?

- A. Twice the value of one capacitor
- B. Half the value of one capacitor
- C. The same as the value of either capacitor
- D. The value of one capacitor times the value of the other

Metric system prefixes & decibels

T7A20 How many microfarads is 1,000,000 picofarads?

- A. 0.001 microfarads
- B. 1 microfarad
- C. 1000 microfarads
- D. 1,000,000,000 microfarads

T7A21 If you have a hand-held transceiver with an output of 500 milliwatts, how many watts would this be?

- A. 0.02
- B. 0.5
- C. 5
- D. 50

T7A17 If an ammeter marked in amperes is used to measure a 3000-milliampere current, what reading would it show?

- A. 0.003 amperes
- B. 0.3 amperes
- C. 3 amperes
- D. 3,000,000 amperes

T7A16 If you increase your transmitter output power from 5 watts to 10 watts, what decibel (dB) increase does that represent?

- A. 2 dB
- B. 3 dB
- C. 5 dB
- D. 10 dB

Fuses

T0A02 Which electrical circuit draws high current?

- A. An open circuit
- B. A dead circuit
- C. A closed circuit
- D. A short circuit

T0A10 What type of electrical circuit is created when a fuse blows?

- A. A closed circuit
- B. A bypass circuit
- C. An open circuit
- D. A short circuit

T0A03 What could happen to your transceiver if you replace its blown 5 amp AC line fuse with a 30 amp fuse?

- A. The 30-amp fuse would better protect your transceiver from using too much current
- B. The transceiver would run cooler
- C. The transceiver could use more current than 5 amps and a fire could occur
- D. The transceiver would not be able to produce as much RF output

T0A13 When fuses are installed in 12-volt DC wiring, where should they be placed?

- A. At the radio
- B. Midway between voltage source and radio
- C. Fuses aren't required for 12-volt DC equipment
- D. At the voltage source

T0A12 What safety equipment item should you always add to home built equipment that is powered from 110 volt AC lines?

- A. A fuse or circuit breaker in series with the equipment
- B. A fuse or circuit breaker in parallel with the equipment
- C. Install Zener diodes across AC inputs
- D. House the equipment in a plastic or other non-conductive enclosure

Other components

T7B10 Which component can amplify a small signal using low voltages?

- A. A PNP transistor
- B. A variable resistor
- C. An electrolytic capacitor
- D. A multiple-cell battery

T7B11 Which component can amplify a small signal but normally uses high voltages?

- A. A transistor
- B. An electrolytic capacitor
- C. A vacuum tube
- D. A multiple-cell battery

T7C09 What component controls current to flow in one direction only?

- A. A fixed resistor
- B. A signal generator
- C. A diode
- D. A fuse

T7C10 What is one advantage of using ICs (integrated circuits) instead of vacuum tubes in a circuit?

- A. ICs usually combine several functions into one package
- B. ICs can handle high-power input signals
- C. ICs can handle much higher voltages
- D. ICs can handle much higher temperatures

T8F18 What device produces a stable, low-level signal that can be set to a desired frequency?

- A. A wavemeter
- B. A reflectometer
- C. A signal generator
- D. An oscilloscope

T7A11 Which of the following circuits changes an alternating current signal into a varying direct current signal?

- A. Transformer
- B. Rectifier
- C. Amplifier
- D. Director

T7C11 Which symbol of Figure T7-1 represents a fixed resistor?

- A. Symbol 1
- B. Symbol 2
- C. Symbol 3
- D. Symbol 5

T7C12 In Figure T7-1, which symbol represents a variable resistor or potentiometer?

- A. Symbol 1
- B. Symbol 2
- C. Symbol 3
- D. Symbol 12

T7C15 Which symbol of Figure T7-1 represents a fixed-value capacitor?

- A. Symbol 1
- B. Symbol 3
- C. Symbol 5
- D. Symbol 13

T7C14 In Figure T7-1, which symbol represents an NPN transistor?

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

T7C16 In Figure T7-1, which symbol represents an antenna?

- A. Symbol 5
- B. Symbol 7
- C. Symbol 8
- D. Symbol 14

T7C13 In Figure T7-1, which symbol represents a single-cell battery?

- A. Symbol 1
- B. Symbol 6
- C. Symbol 12
- D. Symbol 13

T7C17 In Figure T7-1, which symbol represents a fixed-value iron-core inductor?
A. Symbol 6 B. Symbol 9 C. Symbol 11 D. Symbol 12

T7C08 What does an inductor do?
A. It stores energy electrostatically and opposes a change in voltage
B. It stores energy electrochemically and opposes a change in current
C. It stores energy electromagnetically and opposes a change in current
D. It stores energy electromechanically and opposes a change in voltage

T7A09 What is the basic unit of inductance?
A. The coulomb B. The farad C. The henry D. The ohm

T7C18 In Figure T7-2, which symbol represents a single-pole, double-throw switch?
A. Symbol 1 B. Symbol 2 C. Symbol 3 D. Symbol 4

T7C19 In Figure T7-2, which symbol represents a double-pole, single-throw switch?
A. Symbol 1 B. Symbol 2 C. Symbol 3 D. Symbol 4

Radio waves

Frequency / Wavelength

T2A15 What term means the number of times per second that an alternating current flows back and forth?
A. Pulse rate B. Speed C. Wavelength D. Frequency

T2A16 What is the basic unit of frequency?
A. The hertz B. The watt C. The ampere D. The ohm

T2A12 What is the standard unit of frequency measurement?
A. A megacycle B. A hertz
C. One thousand cycles per second D. EMF, electromagnetic force

T2A03 What does 60 hertz (Hz) mean?
A. 6000 cycles per second B. 60 cycles per second
C. 6000 meters per second D. 60 meters per second

T7A18 How many hertz are in a kilohertz?
A. 10 B. 100 C. 1000 D. 1,000,000

T7B09 If a radio wave makes 3,725,000 cycles in one second, what does this mean?
A. The radio wave's voltage is 3725 kilovolts B. The radio wave's wavelength is 3725 kilometers
C. The radio wave's frequency is 3725 kilohertz D. The radio wave's speed is 3725 kilometers per second

T7A19 If a dial marked in megahertz shows a reading of 3.525 MHz, what would it show if it were marked in kilohertz?
A. 0.003525 kHz B. 35.25 kHz C. 3525 kHz D. 3,525,000 kHz

T0C01 What is radio frequency radiation?
A. Waves of electric and magnetic energy between 3 kHz and 300 GHz
B. Ultra-violet rays emitted by the sun between 20 Hz and 300 GHz
C. Sound energy given off by a radio receiver
D. Beams of X-Rays and Gamma rays emitted by a radio transmitter

T2A11 How fast does a radio wave travel through space (in a vacuum)?

- A. At the speed of light
- B. At the speed of sound
- C. Its speed is inversely proportional to its wavelength
- D. Its speed increases as the frequency increases

T2A04 What is the name for the distance an AC signal travels during one complete cycle?

- A. Wave speed
- B. Waveform
- C. Wavelength
- D. Wave spread

T2A01 What happens to a signal's wavelength as its frequency increases?

- A. It gets shorter
- B. It gets longer
- C. It stays the same
- D. It disappears

T2A14 How is the wavelength of a radio wave related to its frequency?

- A. Wavelength gets longer as frequency increases
- B. Wavelength gets shorter as frequency increases
- C. There is no relationship between wavelength and frequency
- D. The frequency depends on the velocity of the radio wave, but the wavelength depends on the bandwidth of the signal

T2A07 What is an audio-frequency signal?

- A. Wave disturbances that cannot be heard by the human ear
- B. Electromagnetic oscillations or cycles that repeat between 20 and 20,000 times per second
- C. Electromagnetic oscillations or cycles that repeat more than 20,000 times per second
- D. Electric energy that is generated at the front end of an AM or FM radio receiver

T7B05 Most humans can hear sounds in what frequency range?

- A. 0 - 20 Hz
- B. 20 - 20,000 Hz
- C. 200 - 200,000 Hz
- D. 10,000 - 30,000 Hz

T7B06 Why do we call electrical signals in the frequency range of 20 Hz to 20,000 Hz audio frequencies?

- A. Because the human ear cannot sense anything in this range
- B. Because the human ear can sense sounds in this range
- C. Because this range is too low for radio energy
- D. Because the human ear can sense radio waves in this range

T2A06 What is a radio frequency wave?

- A. Wave disturbances that take place at less than 10 times per second
- B. Electromagnetic oscillations or cycles that repeat between 20 and 20,000 times per second
- C. Electromagnetic oscillations or cycles that repeat more than 20,000 times per second
- D. None of these answers are correct

T7B07 What is the lowest frequency of electrical energy that is usually known as a radio frequency?

- A. 20 Hz
- B. 2,000 Hz
- C. 20,000 Hz
- D. 1,000,000 Hz

T7B08 Electrical energy at a frequency of 7125 kHz is in what frequency range?

- A. Audio
- B. Radio
- C. Hyper
- D. Super-high

T2A09 Which of the following choices is often used to identify a particular radio wave?

- A. The frequency or the wavelength of the wave
- B. The length of the magnetic curve of wave
- C. The time it takes for the wave to travel a certain distance
- D. The free-space impedance of the wave

T2A10 How is a radio frequency wave identified?

- A. By its wavelength, the length of a single radio cycle from peak to peak
- B. By its corresponding frequency
- C. By the appropriate radio band in which it is transmitted or received
- D. All of these choices are correct

T2A08 In what radio-frequency range do amateur 2-meter communications take place?

- A. UHF, Ultra High Frequency range
- B. MF, Medium Frequency range
- C. HF, High Frequency range
- D. VHF, Very High Frequency range

Modulation, bandwidth, and emission types

T2A13 What is the basic principle of radio communications?

- A. A radio wave is combined with an information signal and is transmitted; a receiver separates the two
- B. A transmitter separates information to be received from a radio wave
- C. A DC generator combines some type of information into a carrier wave so that it may travel through space
- D. The peak-to-peak voltage of a transmitter is varied by the sidetone and modulated by the receiver

T7B01 What type of electric circuit uses signals that can vary continuously over a certain range of voltage or current values?

- A. An analog circuit
- B. A digital circuit
- C. A continuous circuit
- D. A pulsed modulator circuit

T7B02 What type of electric circuit uses signals that have voltage or current values only in specific steps over a certain range?

- A. An analog circuit
- B. A digital circuit
- C. A step modulator circuit
- D. None of these choices is correct

T2B08 What term describes the process of combining an information signal with a radio signal?

- A. Superposition
- B. Modulation
- C. Demodulation
- D. Phase-inversion

T8B02 How is a CW signal usually transmitted?

- A. By frequency-shift keying an RF signal
- B. By on/off keying an RF signal
- C. By audio-frequency-shift keying an oscillator tone
- D. By on/off keying an audio-frequency signal

T7B04 Which of the following is an example of a digital communications method?

- A. Single-sideband (SSB) voice
- B. Amateur Television (ATV)
- C. FM voice
- D. Radioteletype (RTTY)

T8A13 What is one common method of transmitting RTTY on VHF/UHF bands?

- A. Frequency shift the carrier to indicate mark and space at the receiver
- B. Amplitude shift the carrier to indicate mark and space at the receiver
- C. Key the transmitter on to indicate space and off for mark
- D. Modulate a conventional FM transmitter with a modem

T6B02 What is the usual bandwidth of a single-sideband amateur signal?

- A. 1 kHz
- B. 2 kHz
- C. Between 3 and 6 kHz
- D. Between 2 and 3 kHz

T2B11 Which sideband is commonly used for 10-meter phone operation?

- A. Upper sideband
- B. Lower sideband
- C. Amplitude-compandored sideband
- D. Double sideband

T2B15 Which sideband is normally used for VHF/UHF SSB communications?

- A. Upper sideband
- B. Lower sideband
- C. Double sideband
- D. Double sideband, suppressed carrier

T7B03 Which of the following is an example of an analog communications method?

- A. Morse code (CW)
- B. Packet Radio
- C. Frequency-modulated (FM) voice
- D. PSK31

T6B03 What is the usual bandwidth of a frequency-modulated amateur signal?

- A. Less than 5 kHz
- B. Between 5 and 10 kHz
- C. Between 10 and 20 kHz
- D. Greater than 20 kHz

T8C09 Why is FM voice so effective for local VHF/UHF radio communications?

- A. The carrier is not detectable
- B. It is more resistant to distortion caused by reflected signals than the AM modes
- C. It has audio that is less affected by interference from static-type electrical noise than the AM modes
- D. Its RF carrier stays on frequency better than the AM modes

T6B04 What is the usual bandwidth of a UHF amateur fast-scan television signal?
A. More than 6 MHz B. About 6 MHz C. About 3 MHz D. About 1 MHz

T9B15 Which of the following will allow you to monitor Amateur Television (ATV) on the 70-cm band?
A. A portable video camera B. A cable ready TV receiver
C. An SSTV converter D. A TV flyback transformer

T6A12 What is meant by the term "DX"?
A. Best regards B. Distant station C. Calling any station D. Go ahead

T3B10 Which of the following emission modes are considered to be weak-signal modes and have the greatest potential for DX contacts?
A. Single sideband and CW B. Packet radio and RTTY
C. Frequency modulation D. Amateur television

T6B01 Which list of emission types is in order from the narrowest bandwidth to the widest bandwidth?
A. RTTY, CW, SSB voice, FM voice B. CW, FM voice, RTTY, SSB voice
C. CW, RTTY, SSB voice, FM voice D. CW, SSB voice, RTTY, FM voice

T9B11 Which of the following would be the best emission mode for two-way EME contacts?
A. CW B. AM C. FM D. Spread spectrum

T2B10 What does the term "phone transmissions" usually mean?
A. The use of telephones to set up an amateur contact
B. A phone patch between amateur radio and the telephone system
C. AM, FM or SSB voice transmissions by radiotelephony
D. Placing the telephone handset near a transceiver's microphone and speaker to relay a telephone call

T2B13 What name does the FCC use for voice emissions?
A. RTTY B. Data C. CW D. Phone

Operating privileges

T2B01 What are the frequency limits of the 80-meter band in ITU Region 2 for Technician class licensees who have passed a Morse code exam?
A. 3500 - 4000 kHz B. 3675 - 3725 kHz C. 7100 - 7150 kHz D. 7000 - 7300 kHz

T2B05 What emission types are Technician control operators who have passed a Morse code exam allowed to use from 7100 to 7150 kHz in ITU Region 2?
A. CW and data B. Phone C. Data only D. CW only

T2B02 What are the frequency limits of the 10-meter band in ITU Region 2 for Technician class licensees who have passed a Morse code exam?
A. 28.000 - 28.500 MHz B. 28.100 - 29.500 MHz C. 28.100 - 28.500 MHz D. 29.100 - 29.500 MHz

T1B10 If you are operating on 28.400 MHz, in what amateur band are you operating?
A. 80 meters B. 40 meters C. 15 meters D. 10 meters

T2B06 What emission types are Technician control operators who have passed a Morse code exam allowed to use on frequencies from 28.3 to 28.5 MHz?
A. All authorized amateur emission privileges B. CW and data
C. CW and single-sideband phone D. Data and phone

T1B01 What are the frequency limits of the 6-meter band in ITU Region 2?
A. 52.0 - 54.5 MHz B. 50.0 - 54.0 MHz C. 50.1 - 52.1 MHz D. 50.0 - 56.0 MHz

T1B02 What are the frequency limits of the 2-meter band in ITU Region 2?

- A. 144.0 - 148.0 MHz B. 145.0 - 149.5 MHz C. 144.1 - 146.5 MHz D. 144.0 - 146.0 MHz

T2B14 What emission privilege is permitted a Technician class operator in the 219 MHz - 220 MHz frequency range?

- A. Slow-scan television B. Point-to-point digital message forwarding C. FM voice D. Fast-scan television

T1B03 What are the frequency limits of the 1.25-meter band in ITU Region 2?

- A. 225.0 - 230.5 MHz B. 222.0 - 225.0 MHz C. 224.1 - 225.1 MHz D. 220.0 - 226.0 MHz

T1B11 If you are operating on 223.50 MHz, in what amateur band are you operating?

- A. 15 meters B. 10 meters C. 2 meters D. 1.25 meters

T1B04 What are the frequency limits of the 70-centimeter band in ITU Region 2?

- A. 430.0 - 440.0 MHz B. 430.0 - 450.0 MHz C. 420.0 - 450.0 MHz D. 432.0 - 435.0 MHz

T1B15 What are the frequency limits for the amateur radio service for stations located north of Line A in the 70-cm band?

- A. 430 - 450 MHz B. 420 - 450 MHz C. 432 - 450 MHz D. 440 - 450 MHz

T1B05 What are the frequency limits of the 33-centimeter band in ITU Region 2?

- A. 903 - 927 MHz B. 905 - 925 MHz C. 900 - 930 MHz D. 902 - 928 MHz

T1B06 What are the frequency limits of the 23-centimeter band in ITU Region 2?

- A. 1260 - 1270 MHz B. 1240 - 1300 MHz C. 1270 - 1295 MHz D. 1240 - 1246 MHz

T1B07 What are the frequency limits of the 13-centimeter band in ITU Region 2?

- A. 2300 - 2310 MHz and 2390 - 2450 MHz B. 2300 - 2350 MHz and 2400 - 2450 MHz
C. 2350 - 2380 MHz and 2390 - 2450 MHz D. 2300 - 2350 MHz and 2380 - 2450 MHz

T2B12 What is the most transmitter power a Technician control operator with telegraphy credit may use on the 10-meter band?

- A. 5 watts PEP output B. 25 watts PEP output C. 200 watts PEP output D. 1500 watts PEP output

T2B07 What emission types are Technician control operators allowed to use on the amateur 1.25-meter band in ITU Region 2?

- A. Only CW and phone B. Only CW and data
C. Only data and phone D. All amateur emission privileges authorized for use on the band

T6B06 What is a band plan?

- A. A voluntary guideline beyond the divisions established by the FCC for using different operating modes within an amateur band
B. A guideline from the FCC for making amateur frequency band allocations
C. A plan of operating schedules within an amateur band published by the FCC
D. A plan devised by a club to best use a frequency band during a contest

Propagation

T3B01 When a signal travels in a straight line from one antenna to another, what is this called?

- A. Line-of-sight propagation B. Straight line propagation
C. Knife-edge diffraction D. Tunnel ducting

T3A05 When a signal travels along the surface of the Earth, what is this called?

- A. Sky-wave propagation B. Knife-edge diffraction
C. E-region propagation D. Ground-wave propagation

T3A11 When a signal is returned to Earth by the ionosphere, what is this called?

- A. Sky-wave propagation B. Earth-Moon-Earth propagation
C. Ground-wave propagation D. Tropospheric propagation

T3B05 In which of the following frequency ranges does sky-wave propagation least often occur?

- A. LF B. UHF C. HF D. VHF

T3A07 What is the usual cause of sky-wave propagation?

- A. Signals are reflected by a mountain B. Signals are reflected by the Moon
C. Signals are bent back to Earth by the ionosphere D. Signals are retransmitted by a repeater

T3A08 What type of propagation has radio signals bounce several times between Earth and the ionosphere as they travel around the Earth?

- A. Multiple bounce B. Multi-hop C. Skip D. Pedersen propagation

T3B09 Which of the following frequency bands is most likely to experience summertime sporadic-E propagation?

- A. 23 centimeters B. 6 meters C. 70 centimeters D. 1.25 meters

T3B04 What causes VHF radio waves to be propagated several hundred miles over oceans?

- A. A polar air mass B. A widespread temperature inversion
C. An overcast of cirriform clouds D. A high-pressure zone

T3B03 Ducting occurs in which region of the atmosphere?

- A. F2 B. Ecosphere C. Troposphere D. Stratosphere

T3A10 How does the signal loss for a given path through the troposphere vary with frequency?

- A. There is no relationship B. The path loss decreases as the frequency increases
C. The path loss increases as the frequency increases D. There is no path loss at all

T3B13 In relation to sky-wave propagation, what does the term "maximum usable frequency" (MUF) mean?

- A. The highest frequency signal that will reach its intended destination
B. The lowest frequency signal that will reach its intended destination
C. The highest frequency signal that is most absorbed by the ionosphere
D. The lowest frequency signal that is most absorbed by the ionosphere

T3B02 What can happen to VHF or UHF signals going towards a metal-framed building?

- A. They will go around the building B. They can be bent by the ionosphere
C. They can be reflected by the building D. They can be polarized by the building's mass

Ionosphere

T3A06 What type of solar radiation is most responsible for ionization in the outer atmosphere?

- A. Thermal B. Non-ionized particle C. Ultraviolet D. Microwave

T3B11 What is the condition of the ionosphere above a particular area of the Earth just before local sunrise?

- A. Atmospheric attenuation is at a maximum B. The D region is above the E region
C. The E region is above the F region D. Ionization is at a minimum

T3B07 How does the number of sunspots relate to the amount of ionization in the ionosphere?

- A. The more sunspots there are, the greater the ionization B. The more sunspots there are, the less the ionization
C. Unless there are sunspots, the ionization is zero D. Sunspots do not affect the ionosphere

T3B08 How long is an average sunspot cycle?

- A. 2 years B. 5 years C. 11 years D. 17 years

T3A02 Which ionospheric region is closest to the Earth? A. The A region B. The D region C. The E region D. The F region

T3A09 What effect does the D region of the ionosphere have on lower-frequency HF signals in the daytime?

- A. It absorbs the signals B. It bends the radio waves out into space
C. It refracts the radio waves back to earth D. It has little or no effect on 80-meter radio waves

T3A03 Which region of the ionosphere is mainly responsible for absorbing MF/HF radio signals during the daytime?

- A. The F2 region B. The F1 region C. The E region D. The D region

T3A04 Which region of the ionosphere is mainly responsible for long-distance sky-wave radio communications?

- A. D region B. E region C. F1 region D. F2 region

T3A01 What is the name of the area of the atmosphere that makes long-distance radio communications possible by bending radio waves?

- A. Troposphere B. Stratosphere C. Magnetosphere D. Ionosphere

T3A12 How does the range of sky-wave propagation compare to ground-wave propagation?

- A. It is much shorter B. It is much longer C. It is about the same D. It depends on the weather

T3B06 Why should local amateur communications use VHF and UHF frequencies instead of HF frequencies?

- A. To minimize interference on HF bands capable of long-distance communication
B. Because greater output power is permitted on VHF and UHF
C. Because HF transmissions are not propagated locally D. Because signals are louder on VHF and UHF frequencies

T3B12 What happens to signals that take off vertically from the antenna and are higher in frequency than the critical frequency?

- A. They pass through the ionosphere B. They are absorbed by the ionosphere
C. Their frequency is changed by the ionosphere to be below the maximum usable frequency
D. They are reflected back to their source

T9B05 Why do many amateur satellites operate on the VHF/UHF bands?

- A. To take advantage of the skip zone B. Because VHF/UHF equipment costs less than HF equipment
C. To give Technician class operators greater access to modern communications technology
D. Because VHF and UHF signals easily pass through the ionosphere

Amateur Radio Equipment

Transceivers

T0C05 Which of the following categories describes most common amateur use of a hand-held transceiver?

- A. Mobile devices B. Portable devices C. Fixed devices D. None of these choices is correct

T8A01 What two bands are most commonly used by "dual band" hand-held transceivers?

- A. 6 meters and 2 meters B. 2 meters and 1.25 meters C. 2 meters and 70 cm D. 70 cm and 23 cm

T8B11 What device could boost the low-power output from your hand-held radio up to 100 watts?

- A. A voltage divider B. A power amplifier C. A impedance network D. A voltage regulator

T8B13 What can you do if you are told your FM hand-held or mobile transceiver is over deviating?

- A. Talk louder into the microphone B. Let the transceiver cool off
C. Change to a higher power level D. Talk farther away from the microphone

T8B12 What is the result of over deviation in an FM transmitter?

- A. Increased transmitter power B. Out-of-channel emissions
C. Increased transmitter range D. Poor carrier suppression

T8F17 If your mobile transceiver does not power up, what might you check first?

- A. The antenna feedpoint B. The coaxial cable connector
C. The microphone jack D. The 12-volt fuses

T8B09 What might you use instead of a power supply for home operation of a mobile radio?

- A. A filter capacitor B. An alternator C. A 12-volt battery D. A linear amplifier

T8B08 A mobile radio may be operated at home with the addition of which piece of equipment?

- A. An alternator
- B. A power supply
- C. A linear amplifier
- D. A rhombic antenna

T8B10 What device converts 120 V AC to 12 V DC?

- A. A catalytic converter
- B. A low-pass filter
- C. A power supply
- D. An RS-232 interface

T8F16 Where would you connect a voltmeter to a 12-volt transceiver if you think the supply voltage may be low when you transmit?

- A. At the battery terminals
- B. At the fuse block
- C. Midway along the 12-volt power supply wire
- D. At the 12-volt plug on the chassis of the equipment

T8A02 If your mobile transceiver works in your car but not in your home, what should you check first?

- A. The power supply
- B. The speaker
- C. The microphone
- D. The SWR meter

T8A09 Why is it important to provide adequate DC source supply filtering for a mobile transmitter or transceiver?

- A. To reduce AC hum and carrier current device signals
- B. To provide an emergency power source
- C. To reduce stray noise and RF pick-up
- D. To allow the use of smaller power conductors

T8A08 Why is it important to provide adequate power supply filtering for a CW transmitter?

- A. It isn't important, since CW transmitters cannot be modulated by AC hum
- B. To eliminate phase noise
- C. It isn't important, since most CW receivers can easily suppress any hum by using narrow filters
- D. To eliminate modulation of the RF signal by AC hum

T6C11 What may cause a buzzing or hum in the signal of an HF transmitter?

- A. Using an antenna that is the wrong length
- B. Energy from another transmitter
- C. Bad design of the transmitter's RF power output circuit
- D. A bad filter capacitor in the transmitter's power supply

T8A05 What would you connect to a transceiver for voice operation?

- A. A splatter filter
- B. A terminal-voice controller
- C. A receiver audio filter
- D. A microphone

T8A06 What would you connect to a transceiver to send Morse code?

- A. A key-click filter
- B. A telegraph key
- C. An SWR meter
- D. An antenna switch

T8A07 What do many amateurs use to help form good Morse code characters?

- A. A key-operated on/off switch
- B. An electronic keyer
- C. A key-click filter
- D. A DTMF keypad

T8A10 What would you connect to a transceiver for RTTY operation?

- A. A modem and a teleprinter or computer system
- B. A computer, a printer and a RTTY refresh unit
- C. A data-inverter controller
- D. A modem, a monitor and a DTMF keypad

T2B04 What does "connected" mean in a packet-radio link?

- A. A telephone link is working between two stations
- B. A message has reached an amateur station for local delivery
- C. A transmitting station is sending data to only one receiving station; it replies that the data is being received correctly
- D. A transmitting and receiving station are using a digipeater, so no other contacts can take place until they are finished

T8B01 Can a transceiver designed for FM phone operation also be used for single sideband in the weak-signal portion of the 2-meter band?

- A. Yes, with simple modification
- B. Only if the radio is a "multimode" radio
- C. Only with the right antenna
- D. Only with the right polarization

T8A04 Which of the following devices would be useful to create an effective Amateur Radio station for weak-signal VHF communication?

- A. A hand-held VHF FM transceiver
- B. A multi-mode VHF transceiver
- C. An Omni-directional antenna
- D. A mobile VHF FM transceiver

T8F09 What is used to measure relative signal strength in a receiver?

- A. An S meter
- B. An RST meter
- C. A signal deviation meter
- D. An SSB meter

T8C15 Where should the squelch be set for the proper operation of an FM receiver?

- A. Low enough to hear constant background noise
- B. Low enough to hear chattering background noise
- C. At the point that just silences background noise
- D. As far beyond the point of silence as the knob will turn

T8A12 What might happen if you set your receiver's signal squelch too low while attempting to receive packet mode transmissions?

- A. Noise may cause the TNC to falsely detect a data carrier
- B. Weaker stations may not be received
- C. Transmission speed and throughput will be reduced
- D. The TNC could be damaged

T8C07 What is one accurate way to check the calibration of your receiver's tuning dial?

- A. Monitor the BFO frequency of a second receiver
- B. Tune to a popular amateur net frequency
- C. Tune to one of the frequencies of station WWV or WWVH
- D. Tune to another amateur station and ask what frequency the operator is using

T8C03 What circuit is pictured in Figure T8-6, if block 1 is a frequency discriminator?

- A. A double-conversion receiver
- B. A variable-frequency oscillator
- C. A superheterodyne receiver
- D. An FM receiver

T8C11 What is the function of a mixer in a superheterodyne receiver?

- A. To cause all signals outside of a receiver's passband to interfere with one another
- B. To cause all signals inside of a receiver's passband to reinforce one another
- C. To shift the frequency of the received signal so that it can be processed by IF stages
- D. To interface the receiver with an auxiliary device, such as a TNC

T8C04 What is block 1 in the FM receiver shown in Figure T8-6?

- A. A frequency discriminator
- B. A product detector
- C. A frequency-shift modulator
- D. A phase inverter

T8C05 What would happen if block 1 failed to function in the FM receiver diagram shown in Figure T8-6?

- A. The audio output would sound loud and distorted
- B. There would be no audio output
- C. There would be no effect
- D. The receiver's power supply would be short-circuited

T8C01 What type of circuit does Figure T8-5 represent if block 1 is a product detector?

- A. A simple phase modulation receiver
- B. A simple FM receiver
- C. A simple CW and SSB receiver
- D. A double-conversion multiplier

T8C02 If Figure T8-5 is a diagram of a simple single-sideband receiver, what type of circuit should be shown in block 1?

- A. A high pass filter
- B. A ratio detector
- C. A low pass filter
- D. A product detector

T8C06 What circuit function is found in all types of receivers?

- A. An audio filter
- B. A beat-frequency oscillator
- C. A detector
- D. An RF amplifier

T8C08 What circuit combines signals from an IF amplifier stage and a beat-frequency oscillator (BFO), to produce an audio signal?

- A. An AGC circuit
- B. A detector circuit
- C. A power supply circuit
- D. A VFO circuit

T8B04 What circuit is pictured in Figure T8-1 if block 1 is a variable-frequency oscillator?

- A. A packet-radio transmitter
- B. A crystal-controlled transmitter
- C. A single-sideband transmitter
- D. A VFO-controlled transmitter

T8B03 What purpose does block 1 serve in the simple CW transmitter pictured in Figure T8-1?

- A. It detects the CW signal
- B. It controls the transmitter frequency
- C. It controls the transmitter output power
- D. It filters out spurious emissions from the transmitter

T8B05 What circuit is shown in Figure T8-2 if block 1 represents a reactance modulator?

- A. A single-sideband transmitter
- B. A double-sideband AM transmitter
- C. An FM transmitter
- D. A product transmitter

T8B06 How would the output of the FM transmitter shown in Figure T8-2 be affected if the audio amplifier failed to operate (assuming block 1 is a reactance modulator)?

- A. There would be no output from the transmitter
- B. The output would be 6-dB below the normal output power
- C. The transmitted audio would be distorted but understandable
- D. The output would be an unmodulated carrier

T2B18 What emissions do a transmitter using a reactance modulator produce?

- A. CW
- B. Test
- C. Single-sideband, suppressed-carrier phone
- D. Phase-modulated phone

T2B19 What other emission does phase modulation most resemble?

- A. Amplitude modulation
- B. Pulse modulation
- C. Frequency modulation
- D. Single-sideband modulation

T8C13 What type of receiver is shown in Figure T8-7?

- A. Direct conversion
- B. Superregenerative
- C. Single-conversion superheterodyne
- D. Dual conversion superheterodyne

T8C14 What emission mode could the receiver in Figure T8-7 detect?

- A. AM
- B. FM
- C. Single sideband (SSB)
- D. CW

T8C12 What frequency or frequencies could the radio shown in Figure T8-7 receive?

- A. 136.3 MHz
- B. 157.7 MHz and 10.7 MHz
- C. 10.7 MHz
- D. 147.0 MHz and 168.4 MHz

Antennas

T8D02 Which is true of "rubber duck" antennas for hand-held transceivers?

- A. The shorter they are, the better they perform
- B. They are much less efficient than a quarter-wavelength telescopic antenna
- C. They offer the highest amount of gain possible for any hand-held transceiver antenna
- D. They have a good long-distance communications range

T8D01 Which of the following will improve the operation of a hand-held radio inside a vehicle?

- A. Shielding around the battery pack
- B. A good ground to the belt clip
- C. An external antenna on the roof
- D. An audio amplifier

T8D20 What is one advantage to using a multiband antenna?

- A. You can operate on several bands with a single feed line
- B. Multiband antennas always have high gain
- C. You can transmit on several frequencies simultaneously
- D. Multiband antennas offer poor harmonic suppression

T8A14 What would you use to connect a dual-band antenna to a mobile transceiver that has separate VHF and UHF output connectors?

- A. A dual-needle SWR meter
- B. A full-duplex phone patch
- C. Twin high-pass filters
- D. A duplexer

T8D15 If the ends of a half-wavelength dipole antenna (mounted at least a half-wavelength high) point east and west, which way would the antenna send out radio energy?

- A. Equally in all directions B. Mostly up and down C. Mostly north and south D. Mostly east and west

T8D19 How will increasing antenna gain by 3 dB affect your signal's effective radiated power in the direction of maximum radiation?

- A. It will cut it in half B. It will not change C. It will double it D. It will quadruple it

T8D12 What is a cubical quad antenna?

- A. Four straight, parallel elements in line with each other, each approximately 1/2-electrical wavelength long
B. Two or more parallel four-sided wire loops, each approximately one-electrical wavelength long
C. A vertical conductor 1/4-electrical wavelength high, fed at the bottom
D. A center-fed wire 1/2-electrical wavelength long

T8D11 In Figure T8-8, what is the name of element 1 of the Yagi antenna?

- A. Director B. Reflector C. Boom D. Driven element

T8D09 In Figure T8-8, what is the name of element 2 of the Yagi antenna?

- A. Director B. Reflector C. Boom D. Driven element

T8D10 In Figure T8-8, what is the name of element 3 of the Yagi antenna?

- A. Director B. Reflector C. Boom D. Driven element

T8E14 What point in an antenna system is called the feed point?

- A. The antenna connection on the back of the transmitter B. Halfway between the transmitter and the feed line
C. At the point where the feed line joins the antenna D. At the tip of the antenna

T8D08 Approximately how long is the driven element of a Yagi antenna?

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

T8D07 Which of the following factors has the greatest effect on the gain of a properly designed Yagi antenna?

- A. The number of elements B. Boom length C. Element spacing D. Element diameter

T9B06 Which antenna system would NOT be a good choice for an EME (moonbounce) station?

- A. A parabolic-dish antenna B. A multi-element array of collinear antennas
C. A ground-plane antenna D. A high-gain array of Yagi antennas

T8D14 What does vertical wave polarization mean?

- A. The electric lines of force of a radio wave are parallel to the Earth's surface
B. The magnetic lines of force of a radio wave are perpendicular to the Earth's surface
C. The electric lines of force of a radio wave are perpendicular to the Earth's surface
D. The electric and magnetic lines of force of a radio wave are parallel to the Earth's surface

T8D13 What does horizontal wave polarization mean?

- A. The magnetic lines of force of a radio wave are parallel to the Earth's surface
B. The electric lines of force of a radio wave are parallel to the Earth's surface
C. The electric lines of force of a radio wave are perpendicular to the Earth's surface
D. The electric and magnetic lines of force of a radio wave are perpendicular to the Earth's surface

T8D17 What electromagnetic wave polarization is used for most satellite operation?

- A. Only horizontal B. Only vertical C. Circular D. No polarization

T8D16 What electromagnetic wave polarization do most repeater antennas have in the VHF and UHF spectrum?

- A. Horizontal B. Vertical C. Right-hand circular D. Left-hand circular

T8D18 Which antenna polarization is used most often for weak signal VHF/UHF SSB operation?

- A. Vertical B. Horizontal C. Right-hand circular D. Left-hand circular

T4A08 Which of the following is NOT an important consideration when selecting a location for a transmitting antenna?

- A. Nearby structures
- B. Height above average terrain
- C. Distance from the transmitter location
- D. Polarization of the feed line

T4A09 What is the height restriction the FCC places on Amateur Radio Service antenna structures without registration with the FCC and FAA?

- A. There is no restriction by the FCC
- B. 200 feet
- C. 300 feet
- D. As permitted by PRB-1

T4A07 What do FCC rules require you to do if you plan to erect an antenna whose height exceeds 200 feet?

- A. Notify the Federal Aviation Administration and register with the FCC
- B. FCC rules prohibit antenna structures above 200 feet
- C. Alternating sections of the supporting structure must be painted international airline orange and white
- D. The antenna structure must be approved by the FCC and DOD

Feed lines and SWR meters

T8E01 What does standing-wave ratio mean?

- A. The ratio of maximum to minimum inductances on a feed line
- B. The ratio of maximum to minimum capacitances on a feed line
- C. The ratio of maximum to minimum impedances on a feed line
- D. The ratio of maximum to minimum voltages on a feed line

T8E02 What instrument is used to measure standing wave ratio?

- A. An ohmmeter
- B. An ammeter
- C. An SWR meter
- D. A current bridge

T8E03 What would an SWR of 1:1 indicate about an antenna system?

- A. That the antenna was very effective
- B. That the transmission line was radiating
- C. That the antenna was reflecting as much power as it was radiating
- D. That the impedance of the antenna and its transmission line were matched

T8E04 What does an SWR reading of 4:1 mean?

- A. An impedance match that is too low
- B. An impedance match that is good, but not the best
- C. An antenna gain of 4
- D. An impedance mismatch; something may be wrong with the antenna system

T8B14 In Figure T8-3, if block 1 is a transceiver and block 3 is a dummy antenna, what is block 2?

- A. A terminal-node switch
- B. An antenna switch
- C. A telegraph key switch
- D. A high-pass filter

T8B15 In Figure T8-3, if block 1 is a transceiver and block 2 is an antenna switch, what is block 3?

- A. A terminal-node switch
- B. An SWR meter
- C. A telegraph key switch
- D. A dummy antenna

T8B07 What minimum rating should a dummy antenna have for use with a 100-watt, single-sideband-phone transmitter?

- A. 100 watts continuous
- B. 141 watts continuous
- C. 175 watts continuous
- D. 200 watts continuous

T8A11 What might you connect between your transceiver and an antenna switch connected to several antennas?

- A. A high-pass filter
- B. An SWR meter
- C. A key-click filter
- D. A mixer

T8B16 In Figure T8-4, if block 1 is a transceiver and block 2 is an SWR meter, what is block 3?

- A. An antenna switch
- B. An antenna tuner
- C. A key-click filter
- D. A terminal-node controller

T8B17 In Figure T8-4, if block 1 is a transceiver and block 3 is an antenna tuner, what is block 2?

- A. A terminal-node switch
- B. A dipole antenna
- C. An SWR meter
- D. A high-pass filter

T8B18 In Figure T8-4, if block 2 is an SWR meter and block 3 is an antenna tuner, what is block 1?
A. A terminal-node switch B. A power supply C. A telegraph key switch D. A transceiver

T8D22 What device might allow use of an antenna on a band it was not designed for?
A. An SWR meter B. A low-pass filter C. An antenna tuner D. A high-pass filter

T8E05 What does an antenna tuner do?
A. It matches a transceiver output impedance to the antenna system impedance
B. It helps a receiver automatically tune in stations that are far away
C. It switches an antenna system to a transceiver when sending, and to a receiver when listening
D. It switches a transceiver between different kinds of antennas connected to one feed line

T8E06 What is a coaxial cable?
A. Two wires side-by-side in a plastic ribbon
B. Two wires side-by-side held apart by insulating rods
C. Two wires twisted around each other in a spiral
D. A center wire inside an insulating material covered by a metal sleeve or shield

T8E07 Why should you use only good quality coaxial cable and connectors for a UHF antenna system?
A. To keep RF loss low
B. To keep television interference high
C. To keep the power going to your antenna system from getting too high
D. To keep the standing-wave ratio of your antenna system high

T8E12 What happens to radio energy when it is sent through a poor quality coaxial cable?
A. It causes spurious emissions
B. It is returned to the transmitter's chassis ground
C. It is converted to heat in the cable
D. It causes interference to other stations near the transmitting frequency

T8E08 What is parallel-conductor feed line?
A. Two wires twisted around each other in a spiral
B. Two wires side-by-side held apart by insulating material
C. A center wire inside an insulating material that is covered by a metal sleeve or shield
D. A metal pipe that is as wide or slightly wider than a wavelength of the signal it carries

T8E09 Which of the following are some reasons to use parallel-conductor, open-wire feed line?
A. It has low impedance and will operate with a high SWR
B. It will operate well even with a high SWR and it works well when tied down to metal objects
C. It has a low impedance and has less loss than coaxial cable
D. It will operate well even with a high SWR and has less loss than coaxial cable

T8E10 What does "balun" mean?
A. Balanced antenna network B. Balanced unloader
C. Balanced unmodulator D. Balanced to unbalanced

T8E11 Where would you install a balun to feed a dipole antenna with 50-ohm coaxial cable?
A. Between the coaxial cable and the antenna B. Between the transmitter and the coaxial cable
C. Between the antenna and the ground D. Between the coaxial cable and the ground

T8E13 What is an unbalanced line?
A. A feed line with neither conductor connected to ground
B. A feed line with both conductors connected to ground
C. A feed line with one conductor connected to ground
D. All of these answers are correct

RF wattmeters

T5B05 What is the term for the average power supplied to an antenna transmission line during one RF cycle at the crest of the modulation envelope?

- A. Peak transmitter power
- B. Peak output power
- C. Average radio-frequency power
- D. Peak envelope power

T8F10 With regard to a transmitter and antenna system, what does "forward power" mean?

- A. The power traveling from the transmitter to the antenna
- B. The power radiated from the top of an antenna system
- C. The power produced during the positive half of an RF cycle
- D. The power used to drive a linear amplifier

T8F11 With regard to a transmitter and antenna system, what does "reflected power" mean?

- A. The power radiated down to the ground from an antenna
- B. The power returned towards the source on a transmission line
- C. The power produced during the negative half of an RF cycle
- D. The power returned to an antenna by buildings and trees

T8F13 If a directional RF wattmeter reads 90 watts forward power and 10 watts reflected power, what is the actual transmitter output power?

- A. 10 watts
- B. 80 watts
- C. 90 watts
- D. 100 watts

T8F12 At what line impedance do most RF watt meters usually operate?

- A. 25 ohms
- B. 50 ohms
- C. 100 ohms
- D. 300 ohms

Calculating antenna length

T8D03 What would be the length, to the nearest inch, of a half-wavelength dipole antenna that is resonant at 147 MHz?

- A. 19 inches
- B. 37 inches
- C. 55 inches
- D. 74 inches

T8D04 How long should you make a half-wavelength dipole antenna for 223 MHz (measured to the nearest inch)?

- A. 112 inches
- B. 50 inches
- C. 25 inches
- D. 12 inches

T8D05 How long should you make a quarter-wavelength vertical antenna for 146 MHz (measured to the nearest inch)?

- A. 112 inches
- B. 50 inches
- C. 19 inches
- D. 12 inches

T8D06 How long should you make a quarter-wavelength vertical antenna for 440 MHz (measured to the nearest inch)?

- A. 12 inches
- B. 9 inches
- C. 6 inches
- D. 3 inches

T8D21 What could be done to reduce the physical length of an antenna without changing its resonant frequency?

- A. Attach a balun at the feed point
- B. Add series capacitance at the feed point
- C. Use thinner conductors
- D. Add a loading coil

Harmonics and filters

T6C08 What circuit blocks RF energy above and below certain limits?

- A. A band-pass filter
- B. A high-pass filter
- C. An input filter
- D. A low-pass filter

T2A02 How does the frequency of a harmonic compare to the desired transmitting frequency?

- A. It is slightly more than the desired frequency
- B. It is slightly less than the desired frequency
- C. It is exactly two, or three, or more times the desired frequency
- D. It is much less than the desired frequency

T2A05 What is the fourth harmonic of a 50.25 MHz signal?

- A. 201.00 MHz B. 150.75 MHz C. 251.50 MHz D. 12.56 MHz

T8C10 Why do many radio receivers have several IF filters of different bandwidths that can be selected by the operator?

- A. Because some frequency bands are wider than others
B. Because different bandwidths help increase the receiver sensitivity
C. Because different bandwidths improve S-meter readings
D. Because some emission types need a wider bandwidth than others to be received properly

T6C02 What type of filter might be connected to an amateur HF transmitter to cut down on harmonic radiation?

- A. A key-click filter B. A low-pass filter C. A high-pass filter D. A CW filter

Operating Practice

Call Signs

T1E04 In which ITU region is Alaska?

- A. ITU Region 1 B. ITU Region 2 C. ITU Region 3 D. ITU Region 4

T1E05 In which ITU region is Guam?

- A. ITU Region 1 B. ITU Region 2 C. ITU Region 3 D. ITU Region 4

T1E11 How does the FCC issue new amateur radio call signs?

- A. By call sign district in random order
B. The applicant chooses a call sign no one else is using
C. By ITU prefix letter(s), call sign district numeral and a suffix in strict alphabetic order
D. The Volunteer Examiners who gave the exams choose a call sign no one else is using

T1E07 How might you obtain a call sign made up of your initials?

- A. Under the vanity call sign program B. In a sequential call sign program
C. In the special event call sign program D. There is no provision for choosing a call sign

T1E02 What letters must be used for the first letter in US amateur call signs?

- A. K, N, U and W B. A, K, N and W C. A, B, C and D D. A, N, V and W

T1E03 What numbers are normally used in US amateur call signs?

- A. Any two-digit number, 10 through 99 B. Any two-digit number, 22 through 45
C. A single digit, 1 through 9 D. A single digit, 0 through 9

T1E01 Which of the following call signs is a valid US amateur call?

- A. UZ4FWD B. KBL7766 C. KB3TMJ D. VE3BKJ

T1E12 Which station call sign format groups are available to Technician Class amateur radio operators?

- A. Group A B. Group B C. Only Group C D. Group C and D

T1E08 How may an amateur radio licensee change his call sign without applying for a vanity call?

- A. By requesting a systematic call sign change on an NCVFC Form 605
B. Paying a Volunteer Examiner team to process a call sign change request
C. By requesting a specific new call sign on an NCVFC Form 605 and sending it to the FCC in Gettysburg, PA
D. Contacting the FCC ULS database using the Internet to request a call sign change

T1E09 How may an amateur radio club obtain a station call sign?

- A. You must apply directly to the FCC in Gettysburg, PA
- B. You must apply through a Club Station Call Sign Administrator
- C. You must submit FCC Form 605 to FCC in Washington, DC
- D. You must notify VE team on NCVEC Form 605

T1E10 Amateurs of which license classes are eligible to apply for temporary use of a 1-by-1 format Special Event call sign?

- A. Only Amateur Extra class amateurs
- B. 1-by-1 format call signs are not authorized in the US Amateur Service
- C. Any FCC-licensed amateur
- D. Only trustees of amateur radio clubs

Station identification

T1E06 What must you transmit to identify your amateur station?

- A. Your "handle"
- B. Your call sign
- C. Your first name and your location
- D. Your full name

T5B01 How often must an amateur station be identified?

- A. At the beginning of a contact and at least every ten minutes after that
- B. At least once during each transmission
- C. At least every ten minutes during and at the end of a contact
- D. At the beginning and end of each transmission

T5B02 What identification, if any, is required when two amateur stations end communications?

- A. No identification is required
- B. One of the stations must transmit both stations' call signs
- C. Each station must transmit its own call sign
- D. Both stations must transmit both call signs

T5B03 What is the longest period of time an amateur station can operate without transmitting its call sign?

- A. 5 minutes
- B. 10 minutes
- C. 15 minutes
- D. 30 minutes

T5B08 If you are using a language besides English to make a contact, what language must you use when identifying your station?

- A. The language being used for the contact
- B. The language being used for the contact, provided the US has a third-party communications agreement with that country
- C. English
- D. Any language of a country that is a member of the International Telecommunication Union

T1A12 What is an amateur communication called that does NOT have the required station identification?

- A. Unidentified communications or signals
- B. Reluctance modulation
- C. Test emission
- D. Tactical communication

T5C01 If you answer someone on the air and then complete your communication without giving your call sign, what type of communication have you just conducted?

- A. Test transmission
- B. Tactical signal
- C. Packet communication
- D. Unidentified communication

T5C09 If an amateur transmits to test access to a repeater without giving any station identification, what type of communication is this called?

- A. A test emission; no identification is required
- B. An illegal unmodulated transmission
- C. An illegal unidentified transmission
- D. A non-communication; no voice is transmitted

T6A01 What is the advantage of using the International Telecommunication Union (ITU) phonetic alphabet when identifying your station?

- A. The words are internationally recognized substitutes for letters
- B. There is no advantage
- C. The words have been chosen to represent Amateur Radio terms
- D. It preserves traditions begun in the early days of Amateur Radio

- T6A02 What is one reason to avoid using "cute" phrases or word combinations to identify your station?
- A. They are not easily understood by non-English-speaking amateurs
 - B. They might offend English-speaking amateurs
 - C. They do not meet FCC identification requirements
 - D. They might be interpreted as codes or ciphers intended to obscure the meaning of your identification

Control Operator, Control Point

T4B01 What is the definition of a control operator of an amateur station?

- A. Anyone who operates the controls of the station
- B. Anyone who is responsible for the station's equipment
- C. Any licensed amateur operator who is responsible for the station's transmissions
- D. The amateur operator with the highest class of license who is near the controls of the station

T4B02 What is the FCC's name for the person responsible for the transmissions from an amateur station?

- A. Auxiliary operator
- B. Operations coordinator
- C. Third-party operator
- D. Control operator

T4B06 When you operate your transmitting equipment alone, what is your official designation?

- A. Engineer in Charge
- B. Commercial radio operator
- C. Third party
- D. Control operator

T5A02 Assuming you operate within your amateur license privileges, what restrictions apply to operating amateur equipment?

- A. You may operate any amateur equipment
- B. You may only operate equipment located at the address printed on your amateur license
- C. You may only operate someone else's equipment if you first notify the FCC
- D. You may only operate store-purchased equipment until you earn your Amateur Extra class license

T4B10 How many transmitters may an amateur licensee control at the same time?

- A. Only one
- B. No more than two
- C. Any number
- D. Any number, as long as they are transmitting in different bands

T5A01 If you are the control operator at the station of another amateur who has a higher-class license than yours, what operating privileges are you allowed?

- A. Any privileges allowed by the higher license
- B. Only the privileges allowed by your license
- C. All the emission privileges of the higher license, but only the frequency privileges of your license
- D. All the frequency privileges of the higher license, but only the emission privileges of your license

T5A06 If you let another amateur with a higher class license than yours control your station, what operating privileges are allowed?

- A. Any privileges allowed by the higher license, as long as proper identification procedures are followed
- B. Only the privileges allowed by your license
- C. All the emission privileges of the higher license, but only the frequency privileges of your license
- D. All the frequency privileges of the higher license, but only the emission privileges of your license

T5A07 If a Technician class licensee uses the station of a General class licensee, how may the Technician licensee operate?

- A. Within the frequency limits of a General class license
- B. Within the limits of a Technician class license
- C. Only as a third party with the General class licensee as the control operator
- D. A Technician class licensee may not operate a General class station

T1C07 What is your responsibility as a station licensee?

- A. You must allow another amateur to operate your station upon request
- B. You must be present whenever the station is operated
- C. You must notify the FCC if another amateur acts as the control operator
- D. You are responsible for the proper operation of the station in accordance with the FCC rules

T5A05 If you transmit from another amateur's station, who is responsible for its proper operation?

- A. Both of you
- B. The other amateur (the station licensee)
- C. You, the control operator
- D. The station licensee, unless the station records show that you were the control operator at the time

T4B12 How could you best keep unauthorized persons from using your amateur station at home?

- A. Use a carrier-operated relay in the main power line
- B. Use a key-operated on/off switch in the main power line
- C. Put a "Danger - High Voltage" sign in the station
- D. Put fuses in the main power line

T4B13 How could you best keep unauthorized persons from using a mobile amateur station in your car?

- A. Disconnect the microphone when you are not using it
- B. Put a "do not touch" sign on the radio
- C. Turn the radio off when you are not using it
- D. Tune the radio to an unused frequency when you are done using it

T4B05 What is the control point of an amateur station?

- A. The on/off switch of the transmitter
- B. The input/output port of a packet controller
- C. The variable frequency oscillator of a transmitter
- D. The location at which the control operator function is performed

T4B04 What is the term for the location at which the control operator function is performed?

- A. The operating desk
- B. The control point
- C. The station location
- D. The manual control location

T4B08 What is the name for the operating position where the control operator has full control over the transmitter?

- A. Field point
- B. Auxiliary point
- C. Control point
- D. Access point

T5A08 What type of amateur station does not require the control operator to be present at the control point?

- A. A locally controlled station
- B. A remotely controlled station
- C. An automatically controlled station
- D. An earth station controlling a space station

T5A03 When an amateur station is transmitting, where must its control operator be, assuming the station is not under automatic control?

- A. At the station's control point
- B. Anywhere in the same building as the transmitter
- C. At the station's entrance, to control entry to the room
- D. Anywhere within 50 km of the station location

T4B03 When must an amateur station have a control operator?

- A. Only when training another amateur
- B. Whenever the station receiver is operated
- C. Whenever the station is transmitting
- D. A control operator is not needed

Third-party messages

T4B07 When does the FCC assume that you authorize transmissions with your call sign as the control operator?

- A. At all times
- B. Only in the evening hours
- C. Only when operating third party traffic
- D. Only when operating as a reciprocal operating station

T5C06 If you let an unlicensed third party use your amateur station, what must you do at your station's control point?

- A. You must continuously monitor and supervise the third-party's participation
- B. You must monitor and supervise the communication only if contacts are made in countries that have no third-party communications agreement with the US
- C. You must monitor and supervise the communication only if contacts are made on frequencies below 30 MHz
- D. You must key the transmitter and make the station identification

T5A09 Why can't unlicensed persons in your family transmit using your amateur station if they are alone with your equipment?

- A. They must not use your equipment without your permission
- B. They must be licensed before they are allowed to be control operators
- C. They must first know how to use the right abbreviations and Q signals
- D. They must first know the right frequencies and emissions for transmitting

T5C04 What is the definition of third-party communications?

- A. A message sent between two amateur stations for someone else
- B. Public service communications for a political party
- C. Any messages sent by amateur stations
- D. A three-minute transmission to another amateur

T5C05 When are third-party messages allowed to be sent to a foreign country?

- A. When sent by agreement of both control operators
- B. When the third party speaks to a relative
- C. They are not allowed under any circumstances
- D. When the US has a third-party agreement with the foreign country or the third party is qualified to be a control operator

T5C07 Besides normal identification, what else must a US station do when sending third-party communications internationally?

- A. The US station must transmit its own call sign at the beginning of each communication, and at least every ten minutes after that
- B. The US station must transmit both call signs at the end of each communication
- C. The US station must transmit its own call sign at the beginning of each communication, and at least every five minutes after that
- D. Each station must transmit its own call sign at the end of each transmission, and at least every five minutes after that

T5C03 What kind of payment is allowed for third-party messages sent by an amateur station?

- A. Any amount agreed upon in advance
- B. Donation of repairs to amateur equipment
- C. Donation of amateur equipment
- D. No payment of any kind is allowed

Repeaters

T5C12 What device is commonly used to retransmit amateur radio signals?

- A. A beacon
- B. A repeater
- C. A radio controller
- D. A duplexer

T9A01 What is the purpose of repeater operation?

- A. To cut your power bill by using someone else's higher power system
- B. To help mobile and low-power stations extend their usable range
- C. To transmit signals for observing propagation and reception
- D. To communicate with stations in services other than amateur

T9A11 What does it mean to say that a repeater has an input and an output frequency?

- A. The repeater receives on one frequency and transmits on another
- B. The repeater offers a choice of operating frequency, in case one is busy
- C. One frequency is used to control the repeater and another is used to retransmit received signals
- D. The repeater must receive an access code on one frequency before retransmitting received signals

T9A05 When using a repeater to communicate, which of the following do you need to know about the repeater?

- A. Its input frequency and offset
- B. Its call sign
- C. Its power level
- D. Whether or not it has an autopatch

T9A09 What is the usual input/output frequency separation for repeaters in the 2-meter band?

- A. 600 kHz
- B. 1.0 MHz
- C. 1.6 MHz
- D. 5.0 MHz

T9A10 What is the usual input/output frequency separation for repeaters in the 70-centimeter band?

- A. 600 kHz
- B. 1.0 MHz
- C. 1.6 MHz
- D. 5.0 MHz

T9B21 What is the term that describes a repeater that receives signals on one band and retransmits them on another band?

- A. A special coordinated repeater
- B. An illegally operating repeater
- C. An auxiliary station
- D. A crossband repeater

T5A10 If you own a dual-band mobile transceiver, what requirement must be met if you set it up to operate as a crossband repeater?

- A. There is no special requirement if you are licensed for both bands
- B. You must hold an Amateur Extra class license
- C. There must be a control operator at the system's control point
- D. Operating a crossband mobile system is not allowed

T9A08 How could you determine if a repeater is already being used by other stations?

- A. Ask if the frequency is in use, then give your call sign
- B. If you don't hear anyone, assume that the frequency is clear to use
- C. Check for the presence of the CTCSS tone
- D. If the repeater identifies when you key your transmitter, it probably was already in use

T6A04 How do you call another station on a repeater if you know the station's call sign?

- A. Say "break, break 79," then say the station's call sign
- B. Say the station's call sign, then identify your own station
- C. Say "CQ" three times, then say the station's call sign
- D. Wait for the station to call "CQ," then answer it

T9A04 Which of the following is a proper way to break into a conversation on a repeater?

- A. Wait for the end of a transmission and start calling the desired party
- B. Shout, "break, break!" to show that you're eager to join the conversation
- C. Turn on an amplifier and override whoever is talking
- D. Say your call sign during a break between transmissions

T9A06 Why should you pause briefly between transmissions when using a repeater?

- A. To check the SWR of the repeater
- B. To reach for pencil and paper for third-party communications
- C. To listen for anyone wanting to break in
- D. To dial up the repeater's autopatch

T9A02 What is a courtesy tone, as used in repeater operations?

- A. A sound used to identify the repeater
- B. A sound used to indicate when a transmission is complete
- C. A sound used to indicate that a message is waiting for someone
- D. A sound used to activate a receiver in case of severe weather

T9A17 What is the purpose of a repeater time-out timer?

- A. It lets a repeater have a rest period after heavy use
- B. It logs repeater transmit time to predict when a repeater will fail
- C. It tells how long someone has been using a repeater
- D. It limits the amount of time a repeater can transmit continuously

T9A19 Who pays for the site rental and upkeep of most repeaters?

- A. All amateurs, because part of the amateur license examination fee is used
- B. The repeater owner and donations from its users
- C. The Federal Communications Commission
- D. The federal government, using money granted by Congress

T9A18 What should you do if you hear a closed repeater system that you would like to be able to use?

- A. Contact the control operator and ask to join
- B. Use the repeater until told not to
- C. Use simplex on the repeater input until told not to
- D. Write the FCC and report the closed condition

T9A07 Why should you keep transmissions short when using a repeater?

- A. A long transmission may prevent someone with an emergency from using the repeater
- B. To see if the receiving station operator is still awake
- C. To give any listening non-hams a chance to respond
- D. To keep long-distance charges down

T9A03 During commuting rush hours, which type of repeater operation should be discouraged?

- A. Mobile stations
- B. Low-power stations
- C. Highway traffic information nets
- D. Third-party communications nets

T9A13 What is the common amateur meaning of the term "simplex operation"?

- A. Transmitting and receiving on the same frequency
- B. Transmitting and receiving over a wide area
- C. Transmitting on one frequency and receiving on another
- D. Transmitting one-way communications

T9A15 If you are talking to a station using a repeater, how would you find out if you could communicate using simplex instead?

- A. See if you can clearly receive the station on the repeater's input frequency
- B. See if you can clearly receive the station on a lower frequency band
- C. See if you can clearly receive a more distant repeater
- D. See if a third station can clearly receive both of you

T9A14 When should you use simplex operation instead of a repeater?

- A. When the most reliable communications are needed
- B. When a contact is possible without using a repeater
- C. When an emergency telephone call is needed
- D. When you are traveling and need some local information

T9B19 What is a continuous tone-coded squelch system (CTCSS) tone (sometimes called PL -- a Motorola trademark)?

- A. A special signal used for telecommand control of model craft
- B. A sub-audible tone, added to a carrier, which may cause a receiver to accept the signal
- C. A tone used by repeaters to mark the end of a transmission
- D. A special signal used for telemetry between amateur space stations and Earth stations

T9B20 What does it mean if you are told that a tone is required to access a repeater?

- A. You must use keypad tones like your phone system to operate it
- B. You must wait to hear a warbling two-tone signal to operate it
- C. You must wait to hear a courtesy beep tone at the end of another's transmission before you can operate it
- D. You must use a subaudible tone-coded squelch with your signal to operate it

T9B13 What is an autopatch?

- A. An automatic digital connection between a US and a foreign amateur
- B. A digital connection used to transfer data between a hand-held radio and a computer
- C. A device that allows radio users to access the public telephone system
- D. A video interface allowing images to be patched into a digital data stream

T9B14 Which of the following statements about Amateur Radio autopatch usage is true?

- A. The person called using the autopatch must be a licensed radio amateur
- B. The autopatch will allow only local calls to police, fire and ambulance services
- C. Communication through the autopatch is not private
- D. The autopatch should not be used for reporting emergencies

T1A16 Which of the following is a prohibited amateur radio transmission?

- A. Using an autopatch to seek emergency assistance
- B. Using an autopatch to pick up business messages
- C. Using an autopatch to call for a tow truck
- D. Using an autopatch to call home to say you are running late

T9A16 What is it called if the frequency coordinator recommends that you operate on a specific repeater frequency pair?

- A. FCC type acceptance
- B. FCC type approval
- C. Frequency division multiplexing
- D. Repeater frequency coordination

T9A20 If a repeater is causing harmful interference to another amateur repeater and a frequency coordinator has recommended the operation of both repeaters, who is responsible for resolving the interference?

- A. The licensee of the repeater that has been recommended for the longest period of time
- B. The licensee of the repeater that has been recommended the most recently
- C. The frequency coordinator
- D. Both repeater licensees

T2B09 What is the name of the voice emission most used on VHF/UHF repeaters?

- A. Single-sideband phone
- B. Pulse-modulated phone
- C. Slow-scan phone
- D. Frequency-modulated phone

T9A12 What is the most likely reason you might hear Morse code tones on a repeater frequency?

- A. Intermodulation
- B. An emergency request for help
- C. The repeater's identification
- D. A courtesy tone

T9B16 When may slow-scan television be transmitted through a 2-meter repeater?

- A. At any time, providing the repeater control operator authorizes this unique transmission
- B. Never; slow-scan television is not allowed on 2 meters
- C. Only after 5:00 PM local time
- D. Never; slow-scan television is not allowed on repeaters

Other types of stations

T9B01 What is an amateur station called that transmits communications for the purpose of observation of propagation and reception?

- A. A beacon
- B. A repeater
- C. An auxiliary station
- D. A radio control station

T9B02 Which of the following is true of amateur radio beacon stations?

- A. Automatic control is allowed in certain band segments
- B. One-way transmissions are permitted
- C. Maximum output power is 100 watts
- D. All of these choices are correct

T1A08 What is an amateur space station?

- A. An amateur station operated on an unused frequency
- B. An amateur station awaiting its new call letters from the FCC
- C. An amateur station located more than 50 kilometers above the Earth's surface
- D. An amateur station that communicates with the International Space Station

T1A09 Who may be the control operator of an amateur space station?

- A. An amateur holding an Amateur Extra class operator license grant
- B. Any licensed amateur operator
- C. Anyone designated by the commander of the spacecraft
- D. No one unless specifically authorized by the government

T9B03 The control operator of a station communicating through an amateur satellite must hold what class of license?

- A. Amateur Extra or Advanced
- B. Any class except Novice
- C. Any class
- D. Technician with satellite endorsement

T9B07 What does the term "apogee" refer to when applied to an Earth satellite?

- A. The closest point to the Earth in the satellite's orbit
- B. The most distant point from the Earth in the satellite's orbit
- C. The point where the satellite appears to cross the equator
- D. The point when the Earth eclipses the satellite from the sun

T9B08 What does the term "perigee" refer to when applied to an Earth satellite?

- A. The closest point to the Earth in the satellite's orbit
- B. The most distant point from the Earth in the satellite's orbit
- C. The time when the satellite will be on the opposite side of the Earth
- D. The effect that causes the satellite's signal frequency to change

T9B09 What mathematical parameters describe a satellite's orbit?

- A. Its telemetry data
- B. Its Doppler shift characteristics
- C. Its mean motion
- D. Its Keplerian elements

T9B10 What is the typical amount of time an amateur has to communicate with the International Space Station?

- A. 4 to 6 minutes per pass
- B. An hour or two per pass
- C. About 20 minutes per pass
- D. All day

T9B04 How does the Doppler effect change an amateur satellite's signal as the satellite passes overhead?

- A. The signal's amplitude increases or decreases
- B. The signal's frequency increases or decreases
- C. The signal's polarization changes from horizontal to vertical
- D. The signal's circular polarization rotates

T9B17 What is the definition of telecommand?

- A. All communications using the telephone or telegraphy with space stations
- B. A one way transmission to initiate conversation with astronauts aboard a satellite or space station
- C. A one way transmission to initiate, modify or terminate functions of a device at a distance
- D. Two way transmissions to initiate, modify or terminate functions of a device at a distance

T5C02 What is one example of one-way communication that Technician class control operators are permitted by FCC rules?

- A. Transmission for radio control of model craft
- B. Use of amateur television for surveillance purposes
- C. Retransmitting National Weather Service broadcasts
- D. Use of amateur radio as a wireless microphone for a public address system

T5B10 What are the station identification requirements for an amateur transmitter used for telecommand (control) of model craft?

- A. Once every ten minutes
- B. Once every ten minutes, and at the beginning and end of each transmission
- C. At the beginning and end of each transmission
- D. Station identification is not required if the transmitter is labeled with the station licensee's name, address and call sign

T9B12 What minimum information must be on a label affixed to a transmitter used for telecommand (control) of model craft?

- A. Station call sign
- B. Station call sign and the station licensee's name
- C. Station call sign and the station licensee's name and address
- D. Station call sign and the station licensee's class of license

T2B03 What name does the FCC use for telemetry, telecommand or computer communications emissions?

- A. CW
- B. Image
- C. Data
- D. RTTY

T8A03 Which of the following devices would you need to conduct Amateur Radio communications using a data emission?

- A. A telegraph key
- B. A computer
- C. A transducer
- D. A telemetry sensor

T6B05 What name is given to an amateur radio station that is used to connect other amateur stations with the Internet?

- A. A gateway
- B. A repeater
- C. A digipeater
- D. FCC regulations prohibit such a station

FCC Rules

T4A05 Why must an amateur operator have a current US postal mailing address?

- A. So the FCC has a record of the location of each amateur station
- B. To follow the FCC rules and so the licensee can receive mail from the FCC
- C. Because all US amateurs must be US residents
- D. So the FCC can publish a call-sign directory

T4A03 What penalty may the FCC impose if you fail to provide your correct mailing address?

- A. There is no penalty if you do not provide the correct address
- B. You are subject to an administrative fine
- C. Your amateur license could be revoked
- D. You may only operate from your address of record

T4A04 Under what conditions may you transmit from a location different from the address printed on your amateur license?

- A. If the location is under the control of the FCC, whenever the FCC Rules allow
- B. If the location is outside the United States, only for a time period of less than 90 days
- C. Only when you have written permission from the FCC Engineer in Charge
- D. Never; you may only operate at the location printed on your license

T4A02 When may you operate your amateur station somewhere in the US besides the address listed on your license?

- A. Only during times of emergency
- B. Only after giving proper notice to the FCC
- C. During an emergency or an FCC-approved emergency practice
- D. Whenever you want to

T4A06 What is one way to notify the FCC if your mailing address changes?

- A. Fill out an FCC Form 605 using your new address, attach a copy of your license, and mail it to your local FCC Field Office
- B. Fill out an FCC Form 605 using your new address, attach a copy of your license, and mail it to the FCC office in Gettysburg, PA
- C. Call your local FCC Field Office and give them your new address over the phone
- D. Call the FCC office in Gettysburg, PA, and give them your new address over the phone

T4A01 When may you operate your amateur station aboard a cruise ship?

- A. At any time
- B. Only while the ship is not under power
- C. Only with the approval of the master of the ship and not using the ship's radio equipment
- D. Only when you have written permission from the cruise line and only using the ship's radio equipment

T4A10 When may you operate your amateur station aboard an aircraft?

- A. At any time
- B. Only while the aircraft is on the ground
- C. Only with the approval of the pilot in command and not using the aircraft's radio equipment
- D. Only when you have written permission from the airline and only using the aircraft's radio equipment

T1C09 Under what conditions are amateur stations allowed to communicate with stations operating in other radio services?

- A. Never; amateur stations are only permitted to communicate with other amateur stations
- B. When authorized by the FCC or in an emergency
- C. When communicating with stations in the Citizens Radio Service
- D. When a commercial broadcast station is using Amateur Radio frequencies for newsgathering during a natural disaster

T1B14 What does it mean for an amateur station to operate under reciprocal operating authority?

- A. The amateur is operating in a country other than his home country
- B. The amateur is allowing a third party to talk to an amateur in another country
- C. The amateur has permission to communicate in a foreign language
- D. The amateur has permission to communicate with amateurs in another country

T1C10 To what distance limit may Technician class licensees communicate?

- A. Up to 200 miles
- B. There is no distance limit
- C. Only to line of sight contacts distances
- D. Only to contacts inside the USA

T1B12 When are you allowed to communicate with an amateur in a foreign country?

- A. Only when the foreign amateur uses English
- B. Only when you have permission from the FCC
- C. Only when a third party agreement exists between the US and the foreign country
- D. At any time, unless it is not allowed by either government

T1A14 What does the term broadcasting mean?

- A. Transmissions intended for reception by the general public, either direct or relayed
- B. Retransmission by automatic means of programs or signals from non-amateur stations
- C. One-way radio communications, regardless of purpose or content
- D. One-way or two-way radio communications between two or more stations

T1A04 When is an amateur station authorized to transmit information to the general public?

- A. Never
- B. Only when the operator is being paid
- C. Only when the broadcast transmission lasts less than 1 hour
- D. Only when the broadcast transmission lasts longer than 15 minutes

T1A07 Which of the following one-way communications may NOT be transmitted in the amateur service?

- A. Telecommand to model craft
- B. Broadcasts intended for reception by the general public
- C. Brief transmissions to make adjustments to the station
- D. Morse code practice

T1A05 When is an amateur station authorized to transmit music?

- A. Amateurs may not transmit music, except as an incidental part of an authorized rebroadcast of space shuttle communications
- B. Only when the music produces no spurious emissions
- C. Only when the music is used to jam an illegal transmission
- D. Only when the music is above 1280 MHz, and the music is a live performance

T1A06 When is the transmission of codes or ciphers allowed to hide the meaning of a message transmitted by an amateur station?

- A. Only during contests
- B. Only during nationally declared emergencies
- C. Codes and ciphers may not be used to obscure the meaning of a message, although there are special exceptions
- D. Only when frequencies above 1280 MHz are used

T5C08 If an amateur pretends there is an emergency and transmits the word "MAYDAY," what is this called?

- A. A traditional greeting in May
- B. An emergency test transmission
- C. False or deceptive signals
- D. Nothing special; "MAYDAY" has no meaning in an emergency

T1A10 When may false or deceptive signals or communications be transmitted by an amateur station?

- A. Never
- B. When operating a beacon transmitter in a "fox hunt" exercise
- C. When playing a harmless "practical joke"
- D. When you need to hide the meaning of a message for secrecy

T1A11 When may an amateur station transmit unidentified communications?

- A. Only during brief tests not meant as messages
- B. Only when they do not interfere with others
- C. Only when sent from a space station or to control a model craft
- D. Only during two-way or third-party communications

T1A15 Why is indecent and obscene language prohibited in the Amateur Service?

- A. Because it is offensive to some individuals
- B. Because young children may intercept amateur communications with readily available receiving equipment
- C. Because such language is specifically prohibited by FCC Rules
- D. All of these choices are correct

T1A13 What is a transmission called that disturbs other communications?

- A. Interrupted CW
- B. Harmful interference
- C. Transponder signals
- D. Unidentified transmissions

T5B11 Why is transmitting on a police frequency as a "joke" called harmful interference that deserves a large penalty?

- A. It annoys everyone who listens
- B. It blocks police calls that might be an emergency and interrupts police communications
- C. It is in bad taste to communicate with non-amateurs, even as a joke
- D. It is poor amateur practice to transmit outside the amateur bands

T5C10 When may you deliberately interfere with another station's communications?

- A. Only if the station is operating illegally
- B. Only if the station begins transmitting on a frequency you are using
- C. Never
- D. You may expect, and cause, deliberate interference because it can't be helped during crowded band conditions

T5C11 If an amateur repeatedly transmits on a frequency already occupied by a group of amateurs in a net operation, what type of interference is this called?

- A. Break-in interference
- B. Harmful or malicious interference
- C. Incidental interference
- D. Intermittent interference

T5B07 What amount of transmitter power must amateur stations use at all times?

- A. 25 watts PEP output
- B. 250 watts PEP output
- C. 1500 watts PEP output
- D. The minimum legal power necessary to communicate

T6A03 What should you do before you transmit on any frequency?

- A. Listen to make sure others are not using the frequency
- B. Listen to make sure that someone will be able to hear you
- C. Check your antenna for resonance at the selected frequency
- D. Make sure the SWR on your antenna feed line is high enough

T6C09 If someone tells you that signals from your hand-held transceiver are interfering with other signals on a frequency near yours, what may be the cause?

- A. You may need a power amplifier for your hand-held
- B. Your hand-held may have chirp from weak batteries
- C. You may need to turn the volume up on your hand-held
- D. Your hand-held may be transmitting spurious emissions

T6C10 What may happen if an SSB transmitter is operated with the microphone gain set too high?

- A. It may cause digital interference to computer equipment
- B. It may cause splatter interference to other stations operating near its frequency
- C. It may cause atmospheric interference in the air around the antenna
- D. It may cause interference to other stations operating on a higher frequency band

T1B08 If the FCC rules say that the amateur service is a secondary user of a frequency band, and another service is a primary user, what does this mean?

- A. Nothing special; all users of a frequency band have equal rights to operate
- B. Amateurs are only allowed to use the frequency band during emergencies
- C. Amateurs are allowed to use the frequency band only if they do not cause harmful interference to primary users
- D. Amateurs must increase transmitter power to overcome any interference caused by primary users

T5B12 If you are using a frequency within a band assigned to the amateur service on a secondary basis, and a station assigned to the primary service on that band causes interference, what action should you take?

- A. Notify the FCC's regional Engineer in Charge of the interference
- B. Increase your transmitter's power to overcome the interference
- C. Attempt to contact the station and request that it stop the interference
- D. Change frequencies; you may be causing harmful interference to the other station, in violation of FCC rules

T1B13 If you are operating FM phone on the 23-cm band and learn that you are interfering with a radiolocation station outside the US, what must you do?

- A. Stop operating or take steps to eliminate this harmful interference
- B. Nothing, because this band is allocated exclusively to the amateur service
- C. Establish contact with the radiolocation station and ask them to change frequency
- D. Change to CW mode, because this would not likely cause interference

T1B09 What rule applies if two amateur stations want to use the same frequency?

- A. The station operator with a lesser class of license must yield the frequency to a higher-class licensee
- B. The station operator with a lower power output must yield the frequency to the station with a higher power output
- C. Both station operators have an equal right to operate on the frequency
- D. Station operators in ITU Regions 1 and 3 must yield the frequency to stations in ITU Region 2

Procedural signals, Q signals, and Signal Reports

T6A07 What is the meaning of the procedural signal "CQ"?

- A. Call on the quarter hour
- B. New antenna is being tested (no station should answer)
- C. Only the called station should transmit
- D. Calling any station

T6A09 What is the correct way to call CQ when using voice?

- A. Say "CQ" once, followed by "this is," followed by your call sign spoken three times
- B. Say "CQ" at least five times, followed by "this is," followed by your call sign spoken once
- C. Say "CQ" three times, followed by "this is," followed by your call sign spoken three times
- D. Say "CQ" at least ten times, followed by "this is," followed by your call sign spoken once

T6A10 How should you answer a voice CQ call?

- A. Say the other station's call sign at least ten times, followed by "this is," then your call sign at least twice
- B. Say the other station's call sign at least five times phonetically, followed by "this is," then your call sign at least once
- C. Say the other station's call sign at least three times, followed by "this is," then your call sign at least five times phonetically
- D. Say the other station's call sign once, followed by "this is," then your call sign given phonetically

T6B08 What is the meaning of the procedural signal "DE"?

- A. "From" or "this is," as in "W0AIH DE KA9FOX"
- B. "Directional Emissions" from your antenna
- C. "Received all correctly"
- D. "Calling any station"

T6B11 What is the meaning of the procedural signal "K"?

- A. "Any station transmit"
- B. "All received correctly"
- C. "End of message"
- D. "Called station only transmit"

T6B09 What is a good way to call CQ when using Morse code?

- A. Send the letters "CQ" three times, followed by "DE," followed by your call sign sent once
- B. Send the letters "CQ" three times, followed by "DE," followed by your call sign sent three times
- C. Send the letters "CQ" ten times, followed by "DE," followed by your call sign sent twice
- D. Send the letters "CQ" over and over until a station answers

T6B10 How should you answer a Morse code CQ call?

- A. Send your call sign four times
- B. Send the other station's call sign twice, followed by "DE," followed by your call sign twice
- C. Send the other station's call sign once, followed by "DE," followed by your call sign four times
- D. Send your call sign followed by your name, station location and a signal report

T6B07 At what speed should a Morse code CQ call be transmitted?

- A. Only speeds below five WPM
- B. The highest speed your keyer will operate
- C. Any speed at which you can reliably receive
- D. The highest speed at which you can control the keyer

T6B12 What is one meaning of the Q signal "QRS"?

- A. "Interference from static"
- B. "Send more slowly"
- C. "Send RST report"
- D. "Radio station location is"

T6A13 What is the meaning of the term "73"?

- A. Long distance
- B. Best regards
- C. Love and kisses
- D. Go ahead

T6A08 What is a QSL card in the amateur service?

- A. A letter or postcard from an amateur pen pal
- B. A Notice of Violation from the FCC
- C. A written acknowledgment of communications between two amateurs
- D. A postcard reminding you when your license will expire

T6A05 What does RST mean in a signal report?

- A. Recovery, signal strength, tempo
- B. Recovery, signal speed, tone
- C. Readability, signal speed, tempo
- D. Readability, signal strength, tone

T6A06 What is the meaning of: "Your signal report is five nine plus 20 dB...?"

- A. Your signal strength has increased by a factor of 100
- B. Repeat your transmission on a frequency 20 kHz higher
- C. The bandwidth of your signal is 20 decibels above linearity
- D. A relative signal-strength meter reading is 20 decibels greater than strength 9

T6A11 What is the meaning of: "Your signal is full quieting...?"

- A. Your signal is strong enough to overcome all receiver noise
- B. Your signal has no spurious sounds
- C. Your signal is not strong enough to be received
- D. Your signal is being received, but no audio is being heard

T2B16 Which of the following descriptions is used to describe a good signal through a repeater?

- A. Full quieting
- B. Over deviation
- C. Breaking up
- D. Readability zero

Emergencies

T4C02 When may you use your amateur station to transmit an "SOS" or "MAYDAY"?

- A. Never
- B. Only at specific times (at 15 and 30 minutes after the hour)
- C. In a life- or property-threatening emergency
- D. When the National Weather Service has announced a severe weather watch

T4C05 If you are in contact with another station and you hear an emergency call for help on your frequency, what should you do?

- A. Tell the calling station that the frequency is in use
- B. Direct the calling station to the nearest emergency net frequency
- C. Call your local Civil Preparedness Office and inform them of the emergency
- D. Stop your QSO immediately and take the emergency call

T4C01 If you hear a voice distress signal on a frequency outside of your license privileges, what are you allowed to do to help the station in distress?

- A. You are NOT allowed to help because the frequency of the signal is outside your privileges
- B. You are allowed to help only if you keep your signals within the nearest frequency band of your privileges
- C. You are allowed to help on a frequency outside your privileges only if you use international Morse code
- D. You are allowed to help on a frequency outside your privileges in any way possible

T4C06 What is the proper way to interrupt a repeater conversation to signal a distress call?

- A. Say "BREAK" once, then your call sign
- B. Say "HELP" as many times as it takes to get someone to answer
- C. Say "SOS," then your call sign
- D. Say "EMERGENCY" three times

T4C03 If a disaster disrupts normal communication systems in an area where the FCC regulates the amateur service, what kinds of transmissions may stations make?

- A. Those that are necessary to meet essential communication needs and facilitate relief actions
- B. Those that allow a commercial business to continue to operate in the affected area
- C. Those for which material compensation has been paid to the amateur operator for delivery into the affected area
- D. Those that are to be used for program production or newsgathering for broadcasting purposes

T4C04 What information is included in an FCC declaration of a temporary state of communication emergency?

- A. A list of organizations authorized to use radio communications in the affected area
- B. A list of amateur frequency bands to be used in the affected area
- C. Any special conditions and special rules to be observed during the emergency
- D. An operating schedule for authorized amateur emergency stations

T4C07 What is one reason for using tactical call signs such as "command post" or "weather center" during an emergency?

- A. They keep the general public informed about what is going on
- B. They are more efficient and help coordinate public-service communications
- C. They are required by the FCC
- D. They increase goodwill between amateurs

T4C08 What type of messages concerning a person's well being are sent into or out of a disaster area?

- A. Routine traffic
- B. Tactical traffic
- C. Formal message traffic
- D. Health and welfare traffic

T4C09 What are messages called that are sent into or out of a disaster area concerning the immediate safety of human life?

- A. Tactical traffic
- B. Emergency traffic
- C. Formal message traffic
- D. Health and welfare traffic

T5B09 If you are helping in a communications emergency that is being handled by a net control operator, how might you best minimize interference to the net once you have checked in?

- A. Whenever the net frequency is quiet, announce your call sign and location
- B. Move 5 kHz away from the net's frequency and use high power to ask for other emergency communications
- C. Do not transmit on the net frequency until asked to do so by the net operator
- D. Wait until the net frequency is quiet, then ask for any emergency traffic for your area

T4C10 Why is it a good idea to have a way to operate your amateur station without using commercial AC power lines?

- A. So you may use your station while mobile
- B. So you may provide communications in an emergency
- C. So you may operate in contests where AC power is not allowed
- D. So you will comply with the FCC rules

T4C11 What is the most important accessory to have for a hand-held radio in an emergency?

- A. An extra antenna
- B. A portable amplifier
- C. Several sets of charged batteries
- D. A microphone headset for hands-free operation

T4C12 Which type of antenna would be a good choice as part of a portable HF amateur station that could be set up in case of an emergency?

- A. A three-element quad
- B. A three-element Yagi
- C. A dipole
- D. A parabolic dish

T4C14 With what organization must you register before you can participate in RACES drills?

- A. A local Amateur Radio club
- B. A local racing organization
- C. The responsible civil defense organization
- D. The Federal Communications Commission

T4C13 How must you identify messages sent during a RACES drill?

- A. As emergency messages
- B. As amateur traffic
- C. As official government messages
- D. As drill or test messages

Television interference

T6C05 If you are told that your amateur station is causing television interference, what should you do?

- A. First make sure that your station is operating properly, and that it does not cause interference to your own television
- B. Immediately turn off your transmitter and contact the nearest FCC office for assistance
- C. Connect a high-pass filter to the transmitter output and a low-pass filter to the antenna-input terminals of the television
- D. Continue operating normally, because you have no reason to worry about the interference

T4B11 If you have been informed that your amateur radio station causes interference to nearby radio or television broadcast receivers of good engineering design, what operating restrictions can FCC rules impose on your station?

- A. Require that you discontinue operation on frequencies causing interference during certain evening hours and on Sunday morning (local time)
- B. Relocate your station or reduce your transmitter's output power
- C. Nothing, unless the FCC conducts an investigation of the interference problem and issues a citation
- D. Reduce antenna height so as to reduce the area affected by the interference

T6C01 What is meant by receiver overload?

- A. Too much voltage from the power supply
- B. Too much current from the power supply
- C. Interference caused by strong signals from a nearby source
- D. Interference caused by turning the volume up too high

T6C07 If signals from your transmitter are causing front-end overload in your neighbor's television receiver, who is responsible for taking care of the interference?

- A. You alone are responsible, since your transmitter is causing the problem
- B. Both you and the owner of the television receiver share the responsibility
- C. The FCC must decide if you or the owner of the television receiver are responsible
- D. The owner of the television receiver is responsible

T6C03 What type of filter should be connected to a TV receiver as the first step in trying to prevent RF overload from an amateur HF station transmission?

- A. Low-pass
- B. High-pass
- C. Band pass
- D. Notch

T6C06 If harmonic radiation from your transmitter is causing interference to television receivers in your neighborhood, who is responsible for taking care of the interference?

- A. The owners of the television receivers are responsible
- B. Both you and the owners of the television receivers share the responsibility
- C. You alone are responsible, since your transmitter is causing the problem
- D. The FCC must decide if you or the owners of the television receivers are responsible

T6C04 What effect might a break in a cable television transmission line have on amateur communications?

- A. Cable lines are shielded and a break cannot affect amateur communications
- B. Harmonic radiation from the TV receiver may cause the amateur transmitter to transmit off-frequency
- C. TV interference may result when the amateur station is transmitting, or interference may occur to the amateur receiver
- D. The broken cable may pick up very high voltages when the amateur station is transmitting

T6C12 What is the major cause of telephone interference?

- A. The telephone ringer is inadequate
- B. Tropospheric ducting at UHF frequencies
- C. The telephone was not equipped with interference protection when it was manufactured.
- D. Improper location of the telephone in the home

Safety

Tower Safety

T0B06 What should you always do before attempting to climb an antenna tower?

- A. Turn on all radio transmitters that use the tower's antennas
- B. Remove all tower grounding to guard against static electric shock
- C. Put on your safety belt and safety glasses
- D. Inform the FAA and the FCC that you are starting work on a tower

T0B08 What should you consider before you climb a tower with a leather climbing belt?

- A. If the leather is old, it is probably brittle and could break unexpectedly
- B. If the leather is old, it is very tough and is not likely to break easily
- C. If the leather is old, it is flexible and will hold you more comfortably
- D. An unbroken old leather belt has proven its holding strength over the years

T0B03 Why should you wear a hard hat and safety glasses if you are on the ground helping someone work on an antenna tower?

- A. So you won't be hurt if the tower should accidentally fall
- B. To keep RF energy away from your head during antenna testing
- C. To protect your head from something dropped from the tower
- D. So someone passing by will know that work is being done on the tower and will stay away

T0B07 What is the most important safety precaution to take when putting up an antenna tower?

- A. Install steps on your tower for safe climbing
- B. Insulate the base of the tower to avoid lightning strikes
- C. Ground the base of the tower to avoid lightning strikes
- D. Look for and stay clear of any overhead electrical wires

T0B05 Which of the following is the best way to install your antenna in relation to overhead electric power lines?

- A. Always be sure your antenna wire is higher than the power line, and crosses it at a 90-degree angle
- B. Always be sure your antenna and feed line are well clear of any power lines
- C. Always be sure your antenna is lower than the power line, and crosses it at a small angle
- D. Only use vertical antennas within 100 feet of a power line

T0B04 What safety factors must you consider when using a bow and arrow or slingshot and weight to shoot an antenna-support line over a tree?

- A. You must ensure that the line is strong enough to withstand the shock of shooting the weight
- B. You must ensure that the arrow or weight has a safe flight path if the line breaks
- C. You must ensure that the bow and arrow or slingshot is in good working condition
- D. All of these choices are correct

T0B09 What should you do before you climb a guyed tower?

- A. Tell someone that you will be up on the tower
- B. Inspect the tower for cracks or loose bolts
- C. Inspect the guy wires for frayed cable, loose cable clamps, loose turnbuckles or loose guy anchors
- D. All of these choices are correct

T0B10 What should you do before you do any work on top of your tower?

- A. Tell someone that you will be up on the tower
- B. Bring a variety of tools with you to minimize your trips up and down the tower
- C. Inspect the tower before climbing to become aware of any antennas or other obstacles that you may need to step around
- D. All of these choices are correct

T8F15 What safety step should you take when soldering?

- A. Always wear safety glasses
- B. Ensure proper ventilation
- C. Make sure no one can touch the soldering iron tip for at least 10 minutes after it is turned off
- D. All of these choices are correct

Electric Shock / Lightning

T0A01 What is the minimum voltage that is usually dangerous to humans?

- A. 30 volts
- B. 100 volts
- C. 1000 volts
- D. 2000 volts

T0A05 Which body organ can be fatally affected by a very small amount of electrical current?

- A. The heart
- B. The brain
- C. The liver
- D. The lungs

T0A04 How much electrical current flowing through the human body will probably be fatal?

- A. As little as 1/10 of an ampere
- B. Approximately 10 amperes
- C. More than 20 amperes
- D. Current through the human body is never fatal

T0B01 How can an antenna system best be protected from lightning damage?

- A. Install a balun at the antenna feed point
- B. Install an RF choke in the antenna feed line
- C. Ground all antennas when they are not in use
- D. Install a fuse in the antenna feed line

T0B02 How can amateur station equipment best be protected from lightning damage?

- A. Use heavy insulation on the wiring
- B. Never turn off the equipment
- C. Disconnect the ground system from all radios
- D. Disconnect all equipment from the power lines and antenna cables

T0A06 For best protection from electrical shock, what should be grounded in an amateur station?

- A. The power supply primary
- B. All station equipment connected to a common ground
- C. The antenna feed line
- D. The AC power mains

T0A07 Which potential does the green wire in a three-wire electrical plug represent?

- A. Neutral
- B. Hot
- C. Hot and neutral
- D. Ground

T0A08 What is an important consideration for the location of the main power switch?

- A. It must always be near the operator
- B. It must always be as far away from the operator as possible
- C. Everyone should know where it is located in case of an emergency
- D. It should be located in a locked metal box so no one can accidentally turn it off

T0A09 What circuit should be controlled by a safety interlock switch in an amateur transceiver or power amplifier?

- A. The power supply
- B. The IF amplifier
- C. The audio amplifier
- D. The cathode bypass circuit

Radiation Safety

T0C10 Which of the following is considered to be non-ionizing radiation?

- A. X-radiation
- B. Gamma radiation
- C. Ultra violet radiation
- D. Radio frequency radiation

T0E11 What is one effect of RF non-ionizing radiation on the human body?

- A. Cooling of body tissues
- B. Heating of body tissues
- C. Rapid dehydration
- D. Sudden hair loss

T0E09 Which of the following effects on the human body are a result of exposure to high levels of RF energy?

- A. Very rapid hair growth
- B. Very rapid growth of fingernails and toenails
- C. Possible heating of body tissue
- D. High levels of RF energy have no known effect on the human body

T0E08 What is one biological effect to the eye that can result from RF exposure?

- A. The strong magnetic fields can cause blurred vision
- B. The strong magnetic fields can cause polarization lens
- C. It can cause heating, which can result in the formation of cataracts
- D. It can cause heating, which can result in astigmatism

T0E05 Why are Amateur Radio operators required to meet the FCC RF radiation exposure limits?

- A. The standards are applied equally to all radio services
- B. To ensure that RF radiation occurs only in a desired direction
- C. Because amateur station operations are more easily adjusted than those of commercial radio services
- D. To ensure a safe operating environment for amateurs, their families and neighbors

T0E02 Where will you find the applicable FCC RF radiation maximum permissible exposure (MPE) limits defined?

- A. FCC Part 97 Amateur Service Rules and Regulations
- B. FCC Part 15 Radiation Exposure Rules and Regulations
- C. FCC Part 1 and Office of Engineering and Technology (OET) Bulletin 65
- D. Environmental Protection Agency Regulation 65

T0D02 Why do exposure limits vary with frequency?

- A. Lower-frequency RF fields have more energy than higher-frequency fields
- B. Lower-frequency RF fields penetrate deeper into the body than higher-frequency fields
- C. The body's ability to absorb RF energy varies with frequency
- D. It is impossible to measure specific absorption rates at some frequencies

TOC18 Why must the frequency of an RF source be considered when evaluating RF radiation exposure?

- A. Lower-frequency RF fields have more energy than higher-frequency fields
- B. Lower-frequency RF fields penetrate deeper into the body than higher-frequency fields
- C. Higher-frequency RF fields are transient in nature, and do not affect the human body
- D. The human body absorbs more RF energy at some frequencies than at others

T0E07 On what value are the maximum permissible exposure (MPE) limits based?

- A. The square of the mass of the exposed body
- B. The square root of the mass of the exposed body
- C. The whole-body specific gravity (WBSG)
- D. The whole-body specific absorption rate (SAR)

TOC11 What do the FCC RF radiation exposure regulations establish?

- A. Maximum radiated field strength
- B. Minimum permissible HF antenna height
- C. Maximum permissible exposure limits
- D. All of these choices are correct

TOC07 Why is the concept of "duty cycle" one factor used to determine safe RF radiation exposure levels?

- A. It takes into account the amount of time the transmitter is operating at full power during a single transmission
- B. It takes into account the transmitter power supply rating
- C. It takes into account the antenna feed line loss
- D. It takes into account the thermal effects of the final amplifier

TOC19 What is the maximum power density that may be emitted from an amateur station under the FCC RF radiation exposure limits?

- A. The FCC Rules specify a maximum emission of 1.0 milliwatt per square centimeter
- B. The FCC Rules specify a maximum emission of 5.0 milliwatts per square centimeter
- C. The FCC Rules specify exposure limits, not emission limits
- D. The FCC Rules specify maximum emission limits that vary with frequency

T0D08 Referring to Figure T0-1, which of the following equations should you use to calculate the maximum permissible exposure (MPE) on the Technician (with code credit) HF bands for a controlled RF radiation exposure environment?

- A. Maximum permissible power density in mw per square cm equals 900 divided by the square of the operating frequency, in MHz
- B. Maximum permissible power density in mw per square cm equals 180 divided by the square of the operating frequency, in MHz
- C. Maximum permissible power density in mw per square cm equals 900 divided by the operating frequency, in MHz
- D. Maximum permissible power density in mw per square cm equals 180 divided by the operating frequency, in MHz

T0D09 Referring to Figure T0-1, what is the formula for calculating the maximum permissible exposure (MPE) limit for uncontrolled environments on the 2-meter (146 MHz) band?

- A. There is no formula, MPE is a fixed power density of 1.0 milliwatt per square centimeter averaged over any 6 minutes
- B. There is no formula, MPE is a fixed power density of 0.2 milliwatt per square centimeter averaged over any 30 minutes
- C. The MPE in milliwatts per square centimeter equals the frequency in megahertz divided by 300 averaged over any 6 minutes
- D. The MPE in milliwatts per square centimeter equals the frequency in megahertz divided by 1500 averaged over any 30 minutes

T0E06 At what frequencies do the FCC's RF radiation exposure guidelines incorporate limits for Maximum Permissible Exposure (MPE)?

- A. All frequencies below 30 MHz
- B. All frequencies between 20,000 Hz and 10 MHz
- C. All frequencies between 300 kHz and 100 GHz
- D. All frequencies above 300 GHz

T0C04 Over what frequency range are the FCC Regulations most stringent for RF radiation exposure?

- A. Frequencies below 300 kHz
- B. Frequencies between 300 kHz and 3 MHz
- C. Frequencies between 3 MHz and 30 MHz
- D. Frequencies between 30 MHz and 300 MHz

T0C03 Which of the following units of measurement are used to specify the power density of a radiated RF signal?

- A. Milliwatts per square centimeter
- B. Volts per meter
- C. Amperes per meter
- D. All of these choices are correct

T0C09 What unit of measurement specifies RF electric field strength?

- A. Coulombs at one wavelength from the antenna
- B. Volts per meter (V/m)
- C. Microfarads (uF) at the transmitter output
- D. Microhenrys (uH) per square centimeter

T0E03 To determine compliance with the maximum permitted exposure (MPE) levels, safe exposure levels for RF energy are averaged for an "uncontrolled" RF environment over what time period?

- A. 6 minutes
- B. 10 minutes
- C. 15 minutes
- D. 30 minutes

T0E04 To determine compliance with the maximum permitted exposure (MPE) levels, safe exposure levels for RF energy are averaged for a "controlled" RF environment over what time period?

- A. 6 minutes
- B. 10 minutes
- C. 15 minutes
- D. 30 minutes

T0F11 What effect does the antenna gain have on a routine RF exposure evaluation?

- A. Antenna gain is part of the formulas used to perform calculations
- B. The maximum permissible exposure (MPE) limits are directly proportional to antenna gain
- C. The maximum permissible exposure (MPE) limits are the same in all locations surrounding an antenna.
- D. All of these choices are correct

T0F14 Which of the following factors must be taken into account when using a computer program to model RF fields at your station?

- A. Height above sea level at your station
- B. Ionization level in the F2 region of the ionosphere
- C. Ground interactions
- D. The latitude and longitude of your station location

T0D10 What is the minimum safe distance for a controlled RF radiation environment from a station using a half-wavelength dipole antenna on 7 MHz at 100 watts PEP, as specified in Figure T0-2?

- A. 1.4 foot
- B. 2 feet
- C. 3.1 feet
- D. 6.5 feet

TOD11 What is the minimum safe distance for an uncontrolled RF radiation environment from a station using a 3-element "triband" Yagi antenna on 28 MHz at 100 watts PEP, as specified in Figure T0-2?

- A. 7 feet
- B. 11 feet
- C. 24.5 feet
- D. 34 feet

TOD12 What is the minimum safe distance for a controlled RF radiation environment from a station using a 146 MHz quarter-wave whip antenna at 10 watts, as specified in Figure T0-2?

- A. 1.7 feet
- B. 2.5 feet
- C. 1.2 feet
- D. 2 feet

TOD13 What is the minimum safe distance for a controlled RF radiation environment from a station using a 17-element Yagi on a five-wavelength boom on 144 MHz at 100 watts, as specified in Figure T0-2?

- A. 72.4 feet
- B. 78.5 feet
- C. 101 feet
- D. 32.4 feet

TOD14 What is the minimum safe distance for an uncontrolled RF radiation environment from a station using a 446 MHz 5/8-wave ground plane vertical antenna at 10 watts, as specified in Figure T0-2?

- A. 1 foot
- B. 4.3 feet
- C. 9.6 feet
- D. 6 feet

TOC08 What factors affect the resulting RF fields emitted by an amateur transceiver that expose people in the environment?

- A. Frequency and power level of the RF field
- B. Antenna height and distance from the antenna to a person
- C. Radiation pattern of the antenna
- D. All of these answers are correct

TOC06 From an RF safety standpoint, what impact does the duty cycle have on the minimum safe distance separating an antenna and people in the neighboring environment?

- A. The lower the duty cycle, the shorter the compliance distance
- B. The compliance distance is increased with an increase in the duty cycle
- C. Lower duty cycles subject people in the environment to lower radio-frequency radiation
- D. All of these answers are correct

TOC13 Which of the following steps would help you to comply with RF-exposure guidelines for controlled RF environments?

- A. Reduce transmitting times within a 30-minute period to reduce the station duty cycle
- B. Operate only during periods of high solar absorption
- C. Reduce transmitting times within a 6-minute period to reduce the station duty cycle
- D. Operate only on high duty cycle modes

TOC12 Which of the following steps would help you to comply with RF-radiation exposure guidelines for uncontrolled RF environments?

- A. Reduce transmitting times within a 6-minute period to reduce the station duty cycle
- B. Operate only during periods of high solar absorption
- C. Reduce transmitting times within a 30-minute period to reduce the station duty cycle
- D. Operate only on high duty cycle modes

TOC16 Which of the following radio frequency emissions will result in the least RF radiation exposure if they all have the same peak envelope power (PEP)?

- A. Two-way exchanges of phase-modulated (PM) telephony
- B. Two-way exchanges of frequency-modulated (FM) telephony
- C. Two-way exchanges of single-sideband (SSB) telephony
- D. Two-way exchanges of Morse code (CW) communication

Routine station evaluation

TOF08 Above what power level is a routine RF radiation evaluation required for a VHF station?

- A. 25 watts peak envelope power (PEP) measured at the antenna input
- B. 50 watts peak envelope power (PEP) measured at the antenna input
- C. 100 watts input power to the final amplifier stage
- D. 250 watts output power from the final amplifier stage

T0F04 Which category of transceiver is NOT excluded from the requirement to perform a routine station evaluation?

- A. Hand-held transceivers
- B. VHF base station transmitters that deliver more than 50 watts peak envelope power (PEP) to an antenna
- C. Vehicle-mounted push-to-talk mobile radios
- D. Portable transceivers with high duty cycles

T0F07 Below what power level at the input to the antenna are amateur radio operators categorically excluded from routine evaluation to predict if the RF exposure from their VHF station could be excessive?

- A. 25 watts peak envelope power (PEP)
- B. 50 watts peak envelope power (PEP)
- C. 100 watts peak envelope power (PEP)
- D. 500 watts peak envelope power (PEP)

T0F06 How may an amateur determine that his or her station complies with FCC RF-exposure regulations?

- A. By calculation, based on FCC OET Bulletin No. 65
- B. By calculation, based on computer modeling
- C. By measurement, measuring the field strength using calibrated equipment
- D. Any of these choices

T0F01 Is it necessary for you to perform mathematical calculations of the RF radiation exposure if your VHF station delivers more than 50 watts peak envelope power (PEP) to the antenna?

- A. Yes, calculations are always required to ensure greatest accuracy
- B. Calculations are required if your station is located in a densely populated neighborhood
- C. No, calculations may not give accurate results, so measurements are always required
- D. No, there are alternate means to determine if your station meets the RF radiation exposure limits

T0E01 If you do not have the equipment to measure the RF power densities present at your station, what might you do to ensure compliance with the FCC RF radiation exposure limits?

- A. Use one or more of the methods included in the amateur supplement to FCC OET Bulletin 65
- B. Call an FCC-Certified Test Technician to perform the measurements for you
- C. Reduce power from 200 watts PEP to 100 watts PEP
- D. Operate only low-duty-cycle modes such as FM

T0F02 What is one method that amateur radio licensees may use to conduct a routine station evaluation to determine whether the station is within the Maximum Permissible Exposure guidelines?

- A. Direct measurement of the RF fields
- B. Indirect measurement of the energy density at the limit of the controlled area
- C. Estimation of field strength by S-meter readings in the controlled area
- D. Estimation of field strength by taking measurements using a directional coupler in the transmission line

T0F10 Which of the following instruments might you use to measure the RF radiation exposure levels in the vicinity of your station?

- A. A calibrated field strength meter with a calibrated field strength sensor
- B. A calibrated in-line wattmeter with a calibrated length of feed line
- C. A calibrated RF impedance bridge
- D. An amateur receiver with an S meter calibrated to National Bureau of Standards and Technology station WWV

T0F03 What document establishes mandatory procedures for evaluating compliance with RF exposure limits?

- A. There are no mandatory procedures
- B. OST/OET Bulletin 65
- C. Part 97 of the FCC rules
- D. ANSI/IEEE C95.1--1992

T0F09 What must you do with the records of a routine RF radiation exposure evaluation?

- A. They must be sent to the nearest FCC field office
- B. They must be sent to the Environmental Protection Agency
- C. They must be attached to each Form 605 when it is sent to the FCC for processing
- D. Though not required, records may prove useful if the FCC asks for documentation to substantiate that an evaluation has been performed

T0F12 As a general rule, what effect does antenna height above ground have on the RF exposure environment?

- A. Power density is not related to antenna height or distance from the RF exposure environment
- B. Antennas that are farther above ground produce higher maximum permissible exposures (MPE)
- C. The higher the antenna the less the RF radiation exposure at ground level
- D. RF radiation exposure is increased when the antenna is higher above ground

T0F05 Which of the following antennas would (generally) create a stronger RF field on the ground beneath the antenna?

- A. A horizontal loop at 30 meters above ground
- B. A 3-element Yagi at 30 meters above ground
- C. A 1/2 wave dipole antenna 5 meters above ground
- D. A 3-element Quad at 30 meters above ground

T0D04 In the far field, as the distance from the source increases, how does power density vary?

- A. The power density is proportional to the square of the distance
- B. The power density is proportional to the square root of the distance
- C. The power density is proportional to the inverse square of the distance
- D. The power density is proportional to the inverse cube of the distance

T0F15 In which of the following areas is it most difficult to accurately evaluate the effects of RF radiation exposure?

- A. In the far field
- B. In the cybersphere
- C. In the near field
- D. In the low-power field

T0D05 In the near field, how does the field strength vary with distance from the source?

- A. It always increases with the cube of the distance
- B. It always decreases with the cube of the distance
- C. It varies as a sine wave with distance
- D. It depends on the type of antenna being used

T0D07 What factors determine the location of the boundary between the near and far fields of an antenna?

- A. Wavelength and the physical size of the antenna
- B. Antenna height and element length
- C. Boom length and element diameter
- D. Transmitter power and antenna gain

More radiation safety

T0C14 To avoid excessively high human exposure to RF fields, how should amateur antennas generally be mounted?

- A. With a high current point near ground
- B. As far away from accessible areas as possible
- C. On a nonmetallic mast
- D. With the elements in a horizontal polarization

T0C15 What action can amateur operators take to prevent exposure to RF radiation in excess of the FCC-specified limits?

- A. Alter antenna patterns
- B. Relocate antennas
- C. Revise station technical parameters, such as frequency, power, or emission type
- D. All of these choices are correct

T0D01 What factors must you consider if your repeater station antenna will be located at a site that is occupied by antennas for transmitters in other services?

- A. Your radiated signal must be considered as part of the total RF radiation from the site when determining RF radiation exposure levels
- B. Each individual transmitting station at a multiple transmitter site must meet the RF radiation exposure levels
- C. Each station at a multiple-transmitter site may add no more than 1% of the maximum permissible exposure (MPE) for that site
- D. Amateur stations are categorically excluded from RF radiation exposure evaluation at multiple-transmitter sites

T0F13 Why does the FCC consider a hand-held transceiver to be a portable device when evaluating for RF radiation exposure?

- A. Because it is generally a low-power device
- B. Because it is designed to be carried close to your body
- C. Because its transmitting antenna is generally within 20 centimeters of the human body
- D. All of these choices are correct

T0C02 Why is it a good idea to adhere to the FCC's Rules for using the minimum power needed when you are transmitting with your hand-held radio?

- A. Large fines are always imposed on operators violating this rule
- B. To reduce the level of RF radiation exposure to the operator's head
- C. To reduce calcification of the NiCd battery pack
- D. To eliminate self-oscillation in the receiver RF amplifier

T0D03 Why might mobile transceivers produce less RF radiation exposure than hand-held transceivers in mobile operations?

- A. They do not produce less exposure because they usually have higher power levels.
- B. They have a higher duty cycle
- C. When mounted on a metal vehicle roof, mobile antennas are generally well shielded from vehicle occupants
- D. Larger transmitters dissipate heat and energy more readily

T0D06 Why should you never look into the open end of a microwave feed horn antenna while the transmitter is operating?

- A. You may be exposing your eyes to more than the maximum permissible exposure of RF radiation
- B. You may be exposing your eyes to more than the maximum permissible exposure level of infrared radiation
- C. You may be exposing your eyes to more than the maximum permissible exposure level of ultraviolet radiation
- D. All of these choices are correct

T0E10 Why should you not stand within reach of any transmitting antenna when it is being fed with 1500 watts of RF energy?

- A. It could result in the loss of the ability to move muscles
- B. Your body would reflect the RF energy back to its source
- C. It could cause cooling of body tissue
- D. You could accidentally touch the antenna and be injured

Answers

Introduction

T1A01 (B), T1A03 (D), T1A02 (D), T1D03 (D), T1C01 (C), T1C08 (B), T4B09 (B), T1C02 (D), T1D06 (C), T1D07 (C), T1D04 (B), T1D01 (A), T1D02 (D), T1C03 (C), T1C05 (C), T1C04 (A), T1C11 (A), T1C06 (A), T8F14 (B), T5A04 (B), T1D09 (A), T1D08 (D), T1D05 (C), T1D10(A)

Basic Electronics

Electricity

T7A01 (D), T7C01 (C), T7A05 (C), T8F05 (D), T7A02 (B), T7A03 (A), T8F01 (B), T7A06 (A), T7A07 (D), T7C02 (D), T7A08 (D), T8F06 (D), T7C03 (D), T7A04 (B), T8F19 (D), T8F04 (A), T8F20 (B), T8F02 (B), T8F21 (A)

Multimeters

T8F07 (C), T8F08 (D), T8F03 (A)

Ohm's Law

T7A12 (A), T7A13 (C), T7A14 (B), T7A15 (B)

Capacitors

T7C07 (D), T7C04 (A), T7C06 (B), T0A11 (D), T7A10 (A), T7C05 (A)

Metric system prefixes & decibels

T7A20 (B), T7A21 (B), T7A17 (C), T7A16 (B)

Fuses

T0A02 (D), T0A10 (C), T0A03 (C), T0A13 (D), T0A12 (A)

Other components

T7B10 (A), T7B11 (C), T7C09 (C), T7C10 (A), T8F18 (C), T7A11 (B), T7C11 (C), T7C12 (B), T7C15 (A), T7C14 (B), T7C16 (B), T7C13 (D), T7C17 (A), T7C08 (C), T7A09 (C), T7C18 (D), T7C19 (C)

Radio waves

Frequency / Wavelength

T2A15 (D), T2A16 (A), T2A12 (B), T2A03 (B), T7A18 (C), T7B09 (C), T7A19 (C), T0C01 (A), T2A11 (A), T2A04 (C), T2A01 (A), T2A14 (B), T2A07 (B), T7B05 (B), T7B06 (B), T2A06 (C), T7B07 (C), T7B08 (B), T2A09 (A), T2A10 (D), T2A08 (D)

Modulation, bandwidth, and emission types

T2A13 (A), T7B01 (A), T7B02 (B), T2B08 (B), T8B02 (B), T7B04 (D), T8A13 (D), T6B02 (D), T2B11 (A), T2B15 (A), T7B03 (C), T6B03 (C), T8C09 (C), T6B04 (B), T9B15 (B), T6A12 (B), T3B10 (A), T6B01 (C), T9B11 (A), T2B10 (C), T2B13 (D)

Operating privileges

T2B01 (B), T2B05 (D), T2B02 (C), T1B10 (D), T2B06 (C), T1B01 (B), T1B02 (A), T2B14 (B), T1B03 (B), T1B11 (D), T1B04 (C), T1B15 (A), T1B05 (D), T1B06 (B), T1B07 (A), T2B12 (C), T2B07 (D), T6B06 (A).

Propagation

T3B01 (A), T3A05 (D), T3A11 (A), TB05 (B), T3A07 (C), T3A08 (B), T3B09 (B), T3B04 (B), T3B03 (C), T3A10 (C), T3B13 (A), T3B02 (C)

Ionosphere

T3A06 (C), T3B11 (D), T3B07 (A), T3B08 (C), T3A02 (B), T3A09 (A), T3A03 (D), T3A04 (D), T3A01 (D), T3A12 (B), T3B06 (A), T3B12 (A), T9B05 (D)

Amateur Radio Equipment

Transceivers

T0C05 (B), T8A01 (C), T8B11 (B), T8B13 (D), T8B12 (B), T8F17 (D), T8B09 (C), T8B08 (B), T8B10 (C), T8F16 (D), T8A02 (A), T8A09 (C), T8A08 (D), T6C11 (D), T8A05 (D), T8A06 (B), T8A07 (B), T8A10 (A), T2B04 (C), T8B01 (B), T8A04 (B), T8F09 (A), T8C15 (C), T8A12 (A), T8C07 (C), T8C03 (D), T8C11 (C), T8C04 (A), T8C05 (B), T8C01 (C), T8C02 (D), T8C06 (C), T8C08 (B), T8B04 (D), T8B03 (B), T8B05 (C), T8B06 (D), T2B18 (D), T2B19 (C), T8C13 (C), T8C14 (B), T8C12 (D)

Antennas

T8D02 (B), T8D01 (C), T8D20 (A), T8A14 (D), T8D15 (C), T8D19 (C), T8D12 (B), T8D11 (B), T8D09 (D), T8D10 (A), T8E14 (C), T8D08 (C), T8D07 (B), T9B06 (C), T8D14 (C), T8D13 (B), T8D17 (C), T8D16 (B), T8D18 (B), T4A08(D), T4A09 (B), T4A07 (A)

Feed lines and SWR meters

T8E01 (D), T8E02 (C), T8E03 (D), T8E04 (D), T8B14 (B), T8B15 (D), T8B07 (A), T8A11 (B), T8B16 (B), T8B17 (C), T8B18 (D), T8D22 (C), T8E05 (A), T8E06 (D) T8E07 (A), T8E12 (C), T8E08 (B), T8E09 (D), T8E10 (D), T8E11 (A), T8E13 (C)

RF wattmeters

T5B05 (D), T8F10 (A), T8F11 (B), T8F13 (B), T8F12 (B)

Calculating antenna length

T8D03 (B), T8D04(C), T8D05 (C), T8D06 (C), T8D21 (D)

Harmonics and filters

T6C08 (A), T2A02 (C), T2A05 (A), T8C10 (D)T6C02 (B)

Operating Practice

Call Signs

T1E04 (B), T1E05 (C), T1E11 (C), T1E07 (A), T1E02 (B), T1E03 (D), T1E01 (C), T1E12 (D), T1E08 (A), T1E09 (B), T1E10

Station identification

T1E06 (B), T5B01 (C), T5B02 (C), T5B03 (B), T5B08 (C), T1A12 (A), T5C01 (D), T5C09 (C), T6A01 (A), T6A02 (A)

Control Operator, Control Point

T4B01 (C), T4B02 (D), T4B06 (D), T5A02 (A), T4B10 (C), T5A01 (B), T5A06 (A), T5A07 (B), T1C07 (D), T5A05 (A), T4B12 (B), T4B13 (A), T4B05 (D), T4B04 (B), T4B08 (C), T5A08 (C), T5A03 (A), T4B03 (C)

Third-party messages

T4B07 (A), T5C06 (A), T5A09 (B), T5C04 (A), T5C05 (D), T5C07 (B), T5C03 (D)

Repeaters

T5C12 (B), T9A01 (B), T9A11 (A), T9A05 (A), TA09 (A), T9A10 (D), T9B21 (D), T5A10 (C), T9A08 (A), T6A04 (B), T9A04 (D), T9A06 (C), T9A02 (B), T9A17 (D), T9A19 (B), T9A18 (A), T9A07 (A), T9A03 (D), T9A13 (A), T9A15 (A), T9A14 (B), T9B19 (B), T9B20 (D), T9B13 (C), T9B14 (C), T1A16 (B), T9A16 (D), T9A20 (D), T2B09 (D), T9A12 (C), T9B16 (A)

Other types of stations

T9B01 (A), T9B02 (D), T1A08 (C), T1A09 (B), T9B03 (C), T9B07 (B), T9B08 (A), T9B09 (D), T9B10 (A), T9B04 (B), T9B17 (C), T5C02 (A), T5B10 (D), T9B12(C), T2B03 (C), T8A03, T6B05 (A)

FCC Rules

T4A05 (B), T4A03 (C), T4A04 (A), T4A02 (D), T4A06 (B), T4A01 (C), T4A10 (C), T1C09 (B), T1B14 (A), T1C10 (B), T1B12 (D), T1A14 (A), T1A04 (A), T1A07 (B), T1A05 (A), T1A06 (C), T5C08 (C), T1A10 (A), T1A11 (C), T1A15 (D), T1A13 (B), T5B11 (B), T5C10 (C), T5C11 (B), T5B07 (D), T6A03 (A), T6C09 (D), T6C10 (B), T1B08 (C), T5B12 (D), T1B13 (A), T1B09 (C)

Procedural signals, Q signals, and Signal Reports

T6A07 (D), T6A09 (C), T6A10 (D), T6B08 (A), T6B11 (A), T6B09 (B), T6B10 (B), T6B07 (C), T6B12 (B), T6A13 (B), T6A08 (C), T6A05 (D), T6A06 (D), T6A11 (A), T2B16 (A)

Emergencies

T4C02 (C), T4C05 (D), T4C01 (D), T4C06 (A), T4C03 (A), T4C04 (C), T4C07 (B), T4C08 (D), T4C09 (B), T5B09 (C), T4C10 (B), T4C11 (C), T4C12 (C), T4C14 (C), T4C13 (D)

Television interference

T6C05 (A), T4B11 (A), T6C01 (C), T6C07 (D), T6C03 (B), T6C06 (C), T6C04 (C), T6C12 (C)

Safety

Tower Safety

T0B06 (C), T0B08 (A), T0B03 (C), T0B07 (D), T0B05 (B), T0B04 (D), T0B09 (D), T0B10 (D), T8F15 (D)

Electric Shock / Lightning

T0A01 (A), T0A05 (A), T0A04 (A), T0B01 (C), T0B02 (D), T0A06 (B), T0A07 (D), T0A08 (C), T0A09 (A)

Radiation Safety

T0C10 (D), T0E11 (B), T0E09 (C), T0E08 (C), T0E05 (D), T0E02 (C), T0D02 (C), T0C18 (D), T0E07 (D), T0C11 (C), T0C07 (A), T0C19 (C), T0D08 (A), T0D09 (B), T0E06 (C), T0C04 (D), T0C03 (A), T0C09 (B), T0E03 (D), T0E04 (A), T0F11 (A), T0F14 (C), T0D10 (A), T0D11 (C), T0D12 (A), T0D13 (D), T0D14 (B), T0C08 (D), T0C06 (D), T0C13 (C), T0C12 (C), T0C16 (C)

Routine station evaluation

T0F08 (B), T0F04 (B), T0F07 (B), T0F06 (D), T0F01 (D), T0E01 (A), T0F02 (A), T0F10 (A), T0F03 (A), T0F09 (D), T0F12 (C), T0F05 (C), T0D04 (C), T0F15 (C), T0D05 (D), T0D07 (A)

More radiation safety

T0C14 (B), T0C15 (D), T0D01 (A), T0F13 (C), T0C02 (B), T0D03 (C), T0D06 (A), T0E10 (D)

Element 2 (Technician) Graphics – For use on/after July 1, 2003

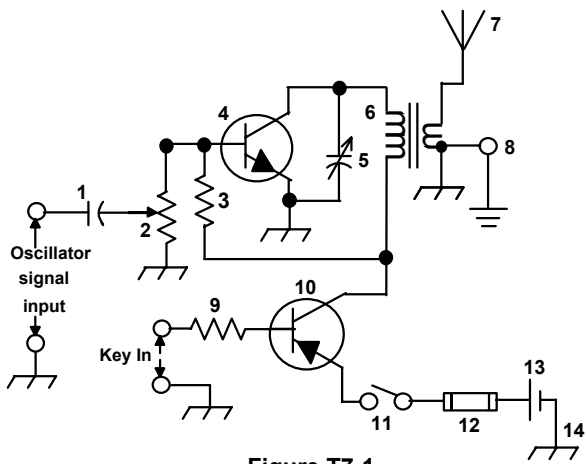


Figure T7-1

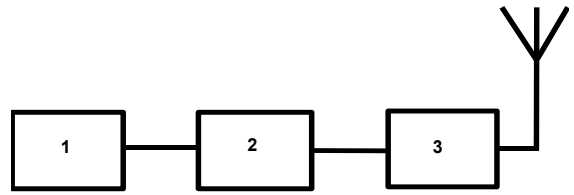


Figure T8-4

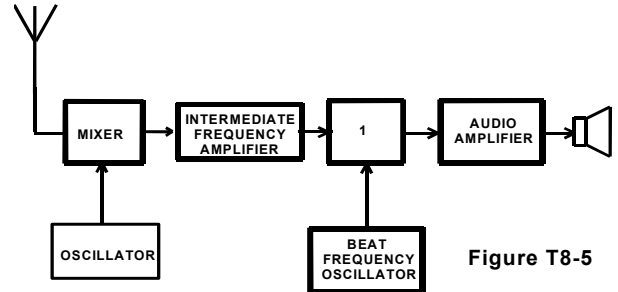


Figure T8-5

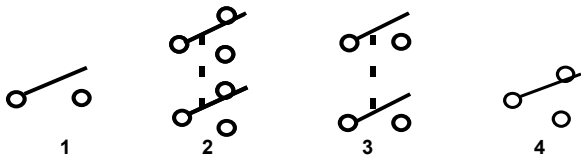


Figure T7-2

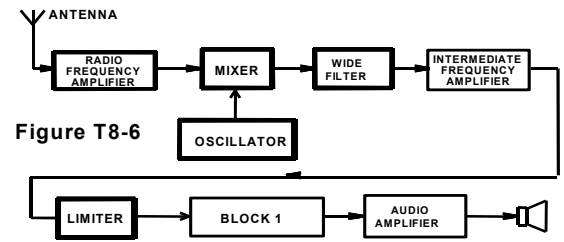


Figure T8-6

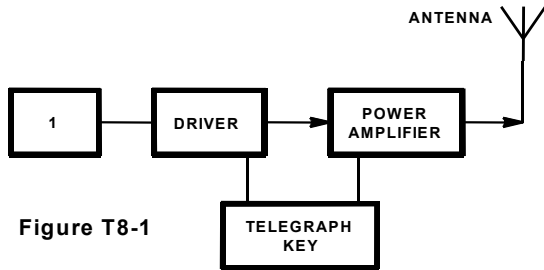


Figure T8-1

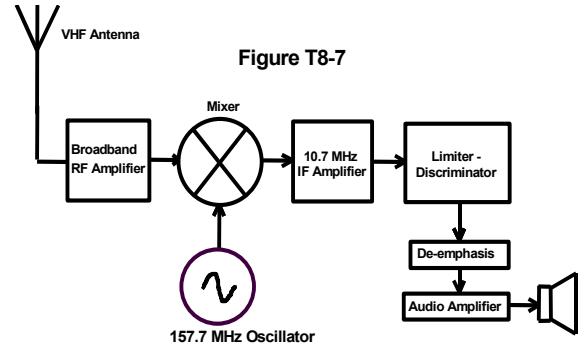


Figure T8-7

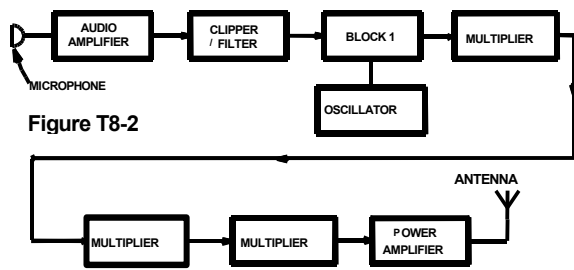


Figure T8-2

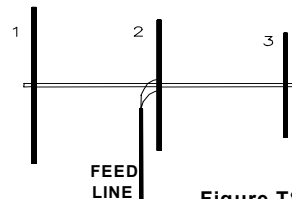


Figure T8-8

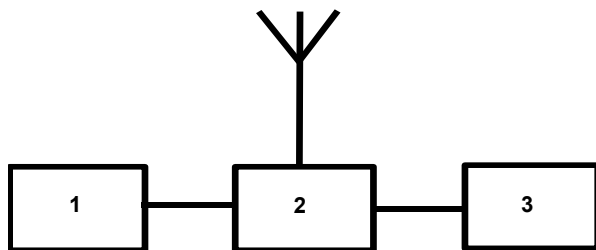


Figure T8-3

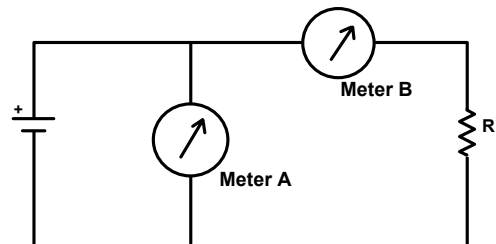


Figure T8-9

Figure T0- 1

(A) Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	Electrical Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	----	----	f/300	6
1500-100,000	----	----	5	6

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electrical Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	----	----	f/1500	30
1500-100,000	----	----	1.0	30

f=frequency in MHz *=Plane-wave equivalent power density

Estimated distances to meet RF power density guidelines in the main beam of a 17-element Yagi on a five-wavelength boom designed for weak signal communications on the 144 MHz amateur radio band (estimated gain, 16.8 dBi). Calculations include the EPA ground reflection factor of 2.56.

Frequency: 144 MHz
 Estimated antenna gain: 16.8 dBi
 Controlled limit: 1 mw/cm²
 Uncontrolled limit: 0.2 mw/cm²

Transmitter power (watts)	Distance to controlled limit	Distance to uncontrolled limit
10	10.2'	22.9'
100	32.4'	72.4'
500	72.4'	162'
1500	125.5'	280.6'

Figure T0- 2

Estimated distances to meet RF power density guidelines with a horizontal half-wave dipole antenna (estimated gain, 2 dBi). Calculations include the EPA ground reflection factor of 2.56.

Frequency: 7 MHz
 Estimated antenna gain: 2 dBi
 Controlled limit: 18.37 mw/cm²
 Uncontrolled limit: 3.67 mw/cm²

Transmitter power (watts)	Distance to controlled limit	Distance to uncontrolled limit
100	1.4'	3.1'
500	3.1'	6.9'
1000	4.3'	9.7'
1500	5.3'	11.9'

Estimated distances to meet RF power density guidelines with a VHF quarter-wave ground plane or mobile whip antenna (estimated gain, 1 dBi). Calculations include the EPA ground reflection factor of 2.56.

Frequency: 146 MHz
 Estimated antenna gain: 1 dBi
 Controlled limit: 1 mw/cm²
 Uncontrolled limit: 0.2 mw/cm²

Transmitter power (watts)	Distance to controlled limit	Distance to uncontrolled limit
10	1.7'	3.7'
50	3.7'	8.3'
150	6.4'	14.4'

Estimated distances to meet RF power density guidelines in the main beam of a typical 3-element "triband" Yagi for the 14, 21 and 28 MHz amateur radio bands. Calculations include the EPA ground reflection factor of 2.56.

Frequency: 28 MHz
 Antenna gain: 8 dBi
 Controlled limit: 1.15 mw/cm²
 Uncontrolled limit: 0.23 mw/cm²

Transmitter power (watts)	Distance to controlled limit	Distance to uncontrolled limit
100	11'	24.5'
500	24.5'	54.9'
1000	34.7'	77.6'
1500	42.5'	95.1'

Estimated distances to meet RF power density guidelines in the main beam of UHF 5/8 ground plane or mobile whip antenna (estimated gain, 4 dBi). Calculations include the EPA ground reflection factor of 2.56.

Frequency: 446 MHz
 Estimated antenna gain: 4 dBi
 Controlled limit: 1.49 mw/cm²
 Uncontrolled limit: 0.3 mw/cm²

Transmitter power (watts)	Distance to controlled limit	Distance to uncontrolled limit
10	1.9'	4.3'
50	4.3'	9.6'
150	7.5'	16.7'