

# Welcome to Ham Cram

**Do Not Turn This Page. This is your personal copy. Mark it up!**

**First the good news:** At the end of today, most – probably greater than 95 percent of the people in this room – will have passed the FCC test to become a Technician Class Amateur (Ham) Radio operator.

Normally, the classes to become a Ham take eight or ten weeks. You are compressing that into a single day. How? By studying – not memorizing – the 392 questions that comprise the pool from which your 35-question exam will be selected. You must get 26 correct answers to pass.

**Now the bad news:** You will be reading the questions over and over, highlighting and then only paying attention to the correct answers. The bad part? This type of “cramming” can be/is deadly dull and doesn’t work well for people with certain learning disabilities.

**Do not attempt to memorize.** just associate the question and its correct answer (not the order, as this will change). When you see the question later the only answer you will be familiar with will be the correct answer. You are reminded not to “think” about the test, just quickly select the answer the “looks” right to you and move on.

On the following pages, the questions are shown with the correct answer. Highlight the correct answer to help fix it in your mind.

## Class Schedule

All participants are **required** to get up and move during each 15-minute hourly break. We’ve found this makes a difference in the passing percentage.

### **Preliminaries 0830-0900:**

Study Period 1 0900-0945 Pages 1-6  
Study Period 2 1000-1045 Pages 7-12  
Study Period 3 1100-1145 Pages 13-18

### **Lunch 1145-1300:**

Study Period 4 1300-1345 Pages 19-24  
Study Period 5 1400-1445 Pages 25-30  
Study Period 6 1500-1545 Pages 31-End + Quick review

### **Exam 1600**

**Important:** Just because you get a license as a result of this event, don’t think you actually understand Ham Radio. See the last page after the test.

**Technician Class License Question Pool**  
**35 Exam Questions**  
**26 “Correct” to Pass**

**SUBELEMENT T1 – FCC Rules, Station License Responsibilities: 4 Exam Questions - 4 Groups**

***T1A - Basis and purpose of the Amateur Radio Service, penalties for unlicensed operation, other penalties, examinations***

**- 1 Exam Question**

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Who is an amateur operator as defined in Part 97?

**X. A person named in an amateur operator/primary license grant in the FCC ULS database**

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What is one of the basic purposes of the Amateur Radio Service as defined in Part 97?

**X. To provide a voluntary noncommercial communications service to the public, particularly in times of emergency**

-----  
What classes of US amateur radio licenses may currently be earned by examination?

**X. Technician, General, Extra**

-----  
Who is a Volunteer Examiner?

**X. An amateur accredited by one or more VECs who volunteers to administer amateur license exams**

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How long is a CSCE valid for license upgrade purposes?

**X. 365 days**

-----  
How many and what class of Volunteer Examiners are required to administer an Element 2 Technician written exam?

**X. Three Examiners holding a General Class license or higher**

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Who makes and enforces the rules for the Amateur Radio Service in the United States?

**X. The Federal Communications Commission**

-----  
What are two of the five fundamental purposes for the Amateur Radio Service?

**X. To increase the number of trained radio operators and electronics experts, and improve international goodwill**

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What is the definition of an amateur radio station?

**X. A station in an Amateur Radio Service consisting of the apparatus necessary for carrying on radio communications**

-----  
What is a transmission called that disturbs other communications?

**X. Harmful interference**

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**- 1 Exam Question**

-----  
What is the ITU?

**X. The International Telecommunication Union**

-----  
What is the purpose of ITU Regions?

**X. They are used to assist in the management of frequency allocations**

-----  
What system does the FCC use to select new amateur radio call signs?

**X. Call signs are assigned in sequential order**

-----  
What FCC call sign program might you use to obtain a call sign containing your initials?

**X. The vanity call sign program**

-----  
How might an amateur radio club obtain a club station call sign?

**X. By applying through a Club Station Call Sign Administrator**

-----  
Who is eligible to apply for temporary use of a 1-by-1 format Special Event call sign?

**X. Any FCC-licensed amateur**

-----  
When are you allowed to operate your amateur station in a foreign country?

**X. When there is a reciprocal operating agreement between the countries**

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

**X. KB3TMJ**

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

**X. A, K, N and W**

-----  
What numbers are used in US amateur call signs?

**X. A single digit, 0 through 9**

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**T1C – Authorized frequencies (Technician), reciprocal licensing, operation near band edges, spectrum sharing**

**- 1 Exam Question**

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What is required before you can control an amateur station in the US?

**X. You must be named in the FCC amateur license database, or be an alien with reciprocal operating authorization**

-----  
Where does a US amateur license allow you to transmit?

**X. From wherever the Amateur Radio Service is regulated by the FCC or where reciprocal agreements are in place**

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

**X. When authorized by the FCC**

-----  
Which frequency is within the 6-meter band?

**X. 52.525 MHz**

-----  
Which amateur band are you using when transmitting on 146.52 MHz?

**X. 2 meter band**

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Which 70-centimeter frequency is authorized to a Technician class license holder operating in ITU Region 2?

**X. 443.350 MHz**

-----  
Which 23 centimeter frequency is authorized to a Technician class license holder operating in ITU Region 2?

**X. 1296 MHz**

-----  
What amateur band are you using if you are operating on 223.50 MHz?

**X. 1.25 meter band**

-----  
What do the FCC rules mean when an amateur frequency band is said to be available on a secondary basis?

**X. Amateurs may not cause harmful interference to primary users**

-----  
When may a US amateur operator communicate with an amateur in a foreign country?

**X. At any time unless prohibited by either government**

-----  
Which of the following types of communications are not permitted in the Amateur Radio Service?

**X. Communications on a regular basis that could reasonably be furnished alternatively through other radio services**

**- 1 Exam Question**

Which of the following services are issued an operator station license by the FCC?

**X. Amateur Radio Service**

Who can become an amateur licensee in the US?

**X. Anyone except a representative of a foreign government**

What is the minimum age required to hold an amateur license?

**X. There is no minimum age requirement**

What government agency grants your amateur radio license?

**X. The Federal Communications Commission**

How soon may you transmit after passing the required examination elements for your first amateur radio license?

**X. As soon as your license grant appears in the FCC's ULS database**

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

**X. 10 years**

What is the grace period during which the FCC will renew an expired 10-year license without re-examination?

**X. 2 years**

What is your responsibility as a station licensee?

**X. Your station must be operated in accordance with the FCC rules**

When may the FCC revoke or suspend a license if the mailing address of the holder is not current with the FCC?

**X. If mail is returned to the FCC as undeliverable**

The FCC requires which address to be kept up to date on the Universal Licensing System database?

**X. The station licensee mailing address**

When are you permitted to continue to transmit if you forget to renew your amateur license and it expires?

**X. Transmitting is not allowed until the license is renewed and appears on the FCC ULS database**

Why must an Amateur radio operator have a correct name and mailing address on file with the FCC?

**X. To receive mail delivery from the FCC by the United States Postal Service**

**SUBELEMENT T2 - Control Operator Duties: 4 Exam Questions - 4 Groups**

**T2A - Prohibited communications: music, broadcasting, codes and ciphers, business use, permissible communications, bulletins, code practice, incidental music**

**- 1 Exam Question**

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

**X. Never**

When is an amateur station authorized to transmit music?

**X. Amateurs may not transmit music, except as incidental to an authorized rebroadcast of space shuttle communications**

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

**X. Only when transmitting control commands to space stations or radio control craft**

When may an amateur station transmit false or deceptive signals?

**X. Never**

When may an amateur station transmit unidentified communications?

**X. Only when sent from a space station or to control a model craft**

What does the term broadcasting mean?

**X. Transmissions intended for reception by the general public, either direct or relayed**

Which of the following are specifically prohibited in the Amateur Radio Service?

**X. Indecent and obscene language**

Which of the following one-way communications may not be transmitted in the Amateur Radio Service?

**X. Broadcasts intended for reception by the general public**

When does the FCC allow an amateur radio station to be used as a method of communication for hire or material compensation?

**X. Only when in accordance with part 97 rules**

What type of communications are prohibited when using a repeater autopatch?

**X. Calls to your employer requesting directions to a customer's office**

When may you use your station to tell people about equipment you have for sale?

**X. When you are offering amateur radio equipment for sale or trade on an occasional basis**

**T2B - Basic identification requirements, repeater ID standards, identification for non-voice modes, identification requirements for mobile and portable operation**

**- 1 Exam Question**

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What must you transmit to identify your amateur station?

**X. Your call sign**

-----  
What is a transmission called that does not contain a station identification?

**X. Unidentified communications or signals**

-----  
How often must an amateur station transmit the assigned call sign?

**X. Every 10 minutes during communications and at the end of each communication**

-----  
What is an acceptable method of transmitting a repeater station identification?

**X. All of these answers are correct.**

-----  
What identification is required when two amateur stations end communications?

**X. Each station must transmit its own call sign**

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

**X. 10 minutes**

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What is a permissible way to identify your station when you are speaking to another amateur operator using a language other than English?

**X. You must identify using the English language**

-----  
How often must you identify using your assigned call sign when operating while using a special event call sign?

**X. Once per hour**

-----  
What is required when using one or more self-assigned indicators with your assigned call sign?

**X. The indicator must not conflict with an indicator specified by FCC rules or with a prefix assigned to another country**

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What is the correct way to identify when visiting a station if you hold a higher class license than that of the station licensee and you are using a frequency not authorized to his class of license?

**X. Send his call sign first, followed by your call sign**

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When exercising the operating privileges earned by examination upgrade of a license what is meant by use of the indicator "/AG"?

**X. Authorized General**

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**T2C – Definition of control operator, location of control operator, automatic and remote control, auxiliary stations**

**- 1 Exam Question**

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What must every amateur station have when transmitting?

**X. A control operator**

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How many amateur operator / primary station licenses may be held by one person?

**X. Only one**

-----  
What minimum class of amateur license must you hold to be a control operator of a repeater station?

**X. Technician**

-----  
Who is responsible for the transmissions from an amateur station?

**X. Control operator**

-----  
When must an amateur station have a control operator?

**X. Whenever the station is transmitting**

-----  
What is the control point of an amateur station?

**X. The location at which the control operator function is performed**

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

**X. An automatically controlled station**

-----  
What are the three types of station control permitted and recognized by FCC rule?

**X. Local, remote and automatic control**

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What type of control is being used on a repeater when the control operator is not present?

**X. Automatic control**

-----  
What type of control is being used when transmitting using a handheld radio?

**X. Local control**

-----  
What type of control is used when the control operator is not at the station location but can still make changes to a transmitter?

**X. Remote control**

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

**X. An operator designated by the licensee to be responsible for the station's transmissions to assure compliance with FCC rules**

**T2D - Operating another person's station, guest operators at your station, third party communications, autopatch, incidental business use, compensation of operators, club stations, station security, station inspection, protection against unauthorized transmissions**

**- 1 Exam Question**

Who is responsible for proper operation if you transmit from another amateur's station?

**X. Both of you**

What operating privileges are allowed when another amateur holding a higher class license is controlling your station?

**X. All privileges allowed by the higher class license**

What operating privileges are allowed when you are the control operator at the station of another amateur who has a higher class license than yours?

**X. Only the privileges allowed by your license**

Which of the following is a prohibited amateur radio transmission?

**X. Using amateur radio for conducting business**

What is the definition of third-party communications?

**X. A message sent between two amateur stations for someone else**

How many persons are required to be members of a club for a club station license to be issued by the FCC?

**X. At least 4**

When may you operate your amateur station aboard an aircraft?

**X. Only with the approval of the pilot in command and not using the aircraft's radio equipment**

When is the FCC allowed to inspect your station equipment and station records?

**X. At any time upon request**

How might you best keep unauthorized persons from using your amateur station?

**X. Disconnect the power and microphone cables when not using your equipment**

Why are unlicensed persons in your family not allowed to transmit on your amateur station if you are not there?

**X. They must be licensed before they are allowed to be control operators**

When is it permissible for the control operator of a club station to accept compensation for sending information bulletins or Morse code practice?

**X. When the station makes those transmissions for at least 40 hours per week**

**SUBELEMENT T3 – Operating Practices: 4 Exam Questions - 4 Groups**

**T3A - Choosing an operating frequency, calling CQ, calling another station, test transmissions**

**- 1 Exam Question**

Which of the following should you do when selecting a frequency on which to transmit?

**X. Listen to determine if the frequency is busy**

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

**X. Say the station's call sign then identify your own station**

How do you indicate you are looking for any station with which to make contact?

**X. CQ followed by your callsign**

What should you transmit when responding to a call of CQ?

**X. The other station's callsign followed by your callsign**

What term describes a brief test transmission that does not include any station identification?

**X. An illegal unidentified transmission**

What must an amateur do when making a transmission to test equipment or antennas?

**X. Properly identify the station**

Which of the following is true when making a test transmission?

**X. Station identification is required at least every ten minutes and at the end of every transmission.**

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

**X. Calling any station**

Why should you avoid using cute phrases or word combinations to identify your station?

**X. They are not easily understood by some operators**

What brief statement is often used in place of "CQ" to indicate that you are listening for calls on a repeater?

**X. Say your call sign**

Why should you use the International Telecommunication Union (ITU) phonetic alphabet when identifying your station?

**X. The words are internationally recognized substitutes for letters**

**- 1 Exam Question**

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What is a band plan?

**X. A voluntary guideline, beyond the divisions established by the FCC for using different operating modes within an amateur band**

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Which of the following statements is true of band plans?

**X. They are voluntary guidelines for efficient use of the radio spectrum**

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Who developed the band plans used by amateur radio operators?

**X. The amateur community**

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Who is in charge of the repeater frequency band plan in your local area?

**X. The recognized frequency coordination body**

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What is the main purpose of repeater coordination?

**X. To reduce interference and promote proper use of spectrum**

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Who is accountable if a repeater station inadvertently retransmits communications that violate FCC rules?

**X. The transmitting station**

-----  
Which of these statements is true about legal power levels on the amateur bands?

**X. An amateur must use the minimum transmitter power necessary to carry out the desired communication**

-----  
Which of the bands available to Technician class licensees have mode restricted sub-bands?

**X. The 6-meter, 2-meter, and 1 1/4-meter bands**

-----  
What emission modes are permitted in the restricted sub-band at 50.0-50.1 MHz?

**X. CW only**

-----  
What emission modes are permitted in the restricted sub-band at 144.0-144.1 MHz?

**X. CW only**

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**- 1 Exam Question**

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What is the proper way to break into a conversation between two stations that are using the frequency?

**X. Say your call sign between their transmissions**

-----  
What is considered to be proper repeater operating practice?

**X. All of these answers are correct**

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What should you do before responding to another stations call?

**X. Make sure you are operating on a permissible frequency for your license class**

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

**X. No frequency will be assigned for the exclusive use of any station and neither has priority**

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

**X. All of these choices are correct**

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Why should amateur radio operators avoid the use of racial or ethnic slurs when talking to other stations?

**X. It is offensive to some people and reflects a poor public image on all amateur radio operators**

-----  
What should you do if you hear a newly licensed operator that is having trouble with their station?

**X. Contact them and offer to help with the problem**

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Where can an official list be found of prohibited obscene and indecent words that should not be used in amateur radio?

**X. There is no official list of prohibited obscene and indecent words**

-----  
What type of subjects are not prohibited communications while using amateur radio?

**X. All of these answers are correct**

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When circumstances are not specifically covered by FCC rules what general operating standard must be applied to amateur station operation?

**X. Good engineering and amateur practices**

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**- 1 Exam Question**

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What should you do if you receive a report that your transmissions are causing splatter or interference on nearby frequencies?

**X. Check transmitter for off frequency operation or spurious emissions**

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Who is responsible for taking care of the interference if signals from your transmitter are causing front end overload in your neighbor's television receiver?

**X. The owner of the television receiver is responsible**

-----  
What is the major cause of telephone interference?

**X. The telephone was not equipped with adequate interference protection when manufactured.**

-----  
What is the proper course of action if you unintentionally interfere with another station?

**X. Properly identify your station and move to a different frequency**

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

**X. Never**

-----  
Who has exclusive use of a specific frequency when the FCC has not declared a communication emergency?

**X. No station has exclusive use of any frequency**

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

**X. TV interference may result when the amateur station is transmitting, or interference may occur to the amateur receiver**

-----  
What is the best way to reduce on the air interference when testing your transmitter?

**X. Use a dummy load when testing**

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What rules apply to your station when using amateur radio at the request of public service officials or at the scene of an emergency?

**X. FCC**

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What do RACES and ARES have in common?

**X. Both organizations provide communications during emergencies**

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What is meant by receiver front-end overload?

**X. Interference caused by strong signals from a nearby source**

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**SUBELEMENT T4 – Radio and Electronic Fundamentals: 5 Exam Questions - 5 Groups**

**T4A – Names of electrical units, DC and AC, what is a radio signal, conductors and insulators, electrical components**

**- 1 Exam Question**

Electrical current is measured in which of the following units?

**X. Amperes**

Electrical Power is measured in which of the following units?

**X. Watts**

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

**X. Current**

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

**X. A direct current**

What is the standard unit of frequency?

**X. The Hertz**

How much voltage does an automobile battery usually supply?

**X. About 12 volts**

What is the basic unit of resistance?

**X. The ohm**

What is the name of a current that reverses direction on a regular basis?

**X. An alternating current**

Which of the following is a good electrical conductor?

**X. Copper**

What is the term used to describe opposition to current flow in ordinary conductors such as wires?

**X. Resistance**

What instrument is used to measure the flow of current in an electrical circuit?

**X. Ammeter**

What instrument is used to measure Electromotive Force (EM F) between two points such as the poles of a battery?

**X. Voltmeter**

**T4B – relationship between frequency and wavelength, identification of bands, names of frequency ranges, types of waves**

**- 1 Exam Question**

What is the name for the distance a radio wave travels during one complete cycle?

**X. Wavelength**

What term describes the number of times that an alternating current flows back and forth per second?

**X. Frequency**

What does 60 hertz (Hz) mean?

**X. 60 cycles per second**

Electromagnetic waves that oscillate more than 20,000 times per second as they travel through space are generally referred to as what?

**X. Radio waves**

How fast does a radio wave travel through space?

**X. At the speed of light**

How does the wavelength of a radio wave relate to its frequency?

**X. The wavelength gets shorter as the frequency increases**

What is the formula for converting frequency to wavelength in meters?

**X. Wavelength in meters equals 300 divided by frequency in megahertz**

What are sound waves in the range between 300 and 3000 Hertz called?

**X. Voice frequencies**

What property of a radio wave is often used to identify the different bands amateur radio operators use?

**X. The physical length of the wave**

What is the frequency range of the 2 meter band in the United States?

**X. 144 to 148 MHz**

What is the frequency range of the 6 meter band in the United States?

**X. 50 to 54 MHz**

What is the frequency range of the 70 centimeter band in the United States?

**X. 420 to 450 MHz**

**- 1 Exam Question**

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What is used to convert radio signals into sounds we can hear?

**X. Receiver**

-----  
What is used to convert sounds from our voice into radio signals?

**X. Transmitter**

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What two devices are combined into one unit in a transceiver?

**X. Receiver, transmitter**

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What device is used to convert the alternating current from a wall outlet into low-voltage direct current?

**X. Power Supply**

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What device is used to increase the output of a 10 watt radio to 100 watts?

**X. Amplifier**

-----  
Which of the battery types listed below offers the longest life when used with a hand-held radio, assuming each battery is the same physical size?

**X. Lithium-ion**

-----  
What is the nominal voltage per cell of a fully charged nickel-cadmium battery?

**X. 1.2 volts**

-----  
What battery type on this list is not designed to be re-charged?

**X. Carbon-zinc**

-----  
What is required to keep rechargeable batteries in good condition and ready for emergencies?

**X. All of these answers are correct**

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What is the best way to get the most amount of energy from a battery?

**X. Draw current from the battery at the slowest rate needed**

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**T4D – Ohms law relationships**

**– 1 Exam Question**

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What formula is used to calculate current in a circuit?

**X. Current (I) equals voltage (E) divided by resistance (R)**

-----  
What formula is used to calculate voltage in a circuit?

**X. Voltage (E) equals current (I) multiplied by resistance (R)**

-----  
What formula is used to calculate resistance in a circuit?

**X. Resistance (R) equals voltage (E) divided by current (I)**

-----  
What is the resistance of a circuit when a current of 3 amperes flows through a resistor connected to 90 volts?

**X. 30 ohms**

-----  
What is the resistance in a circuit where the applied voltage is 12 volts and the current flow is 1.5 amperes?

**X. 8 ohms**

-----  
What is the current flow in a circuit with an applied voltage of 120 volts and a resistance of 80 ohms?

**X. 1.5 amperes**

-----  
What is the voltage across the resistor if a current of 0.5 amperes flows through a 2 ohm resistor?

**X. 1 volt**

-----  
What is the voltage across the resistor if a current of 1 ampere flows through a 10 ohm resistor?

**X. 10 volts**

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What is the voltage across the resistor if a current of 2 amperes flows through a 10 ohm resistor?

**X. 20 volts**

-----  
What is the current flowing through a 100 ohm resistor connected across 200 volts?

**X. 2 amperes**

-----  
What is the current flowing through a 24 ohm resistor connected across 240 volts?

**X. 10 amperes**

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**- 1 Exam Question**

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What unit is used to describe electrical power?

**X. Watt**

-----  
What is the formula used to calculate electrical power in a DC circuit?

**X. Power (P) equals voltage (E) multiplied by current (I)**

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How much power is represented by a voltage of 13.8 volts DC and a current of 10 amperes?

**X. 138 watts**

-----  
How much power is being used in a circuit when the voltage is 120 volts DC and the current is 2.5 amperes?

**X. 300 watts**

-----  
How can you determine how many watts are being drawn by your transceiver when you are transmitting?

**X. Measure the DC voltage at the transceiver and multiply by the current drawn when you transmit** -----

-----  
How many amperes are flowing in a circuit when the applied voltage is 120 volts DC and the load is 1200 watts?

**X. 10 amperes**

-----  
How many milliamperes is the same as 1.5 amperes?

**X. 1500 milliamperes**

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What is another way to specify the frequency of a radio signal that is oscillating at 1,500,000 Hertz?

**X. 1500 kHz**

-----  
How many volts are equal to one kilovolt?

**X. One thousand volts**

-----  
How many volts are equal to one microvolt?

**X. One one-millionth of a volt**

-----  
How many watts does a hand-held transceiver put out if the output power is 500 milliwatts?

**X. 0.5 watts**

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**SUBELEMENT T5 – Station Setup and Operation: 4 Exam Questions - 4 Groups**

**T5A - Station hookup – microphone, speaker, headphones, filters, power source, connecting a computer**

**- 1 Exam Question**

What does a microphone connect to in a basic amateur radio station?

**X. The transmitter**

Which piece of station equipment converts electrical signals to sound waves?

**X. Speaker**

What is the term used to describe what happens when a microphone and speaker are too close to each other?

**X. Audio feedback**

What could you use in place of a regular speaker to help you copy signals in a noisy area?

**X. A set of headphones**

What is a good reason for using a regulated power supply for communications equipment?

**X. To protect equipment from voltage fluctuations**

Where must a filter be installed to reduce spurious emissions?

**X. At the transmitter**

What type of filter should be connected to a TV receiver as the first step in trying to prevent RF overload from a nearby 2-meter transmitter?

**X. Notch filter**

What is connected between the transceiver and computer terminal in a packet radio station?

**X. Terminal Node Controller**

Which of these items is not required for a packet radio station?

**X. Microphone**

What can be used to connect a radio with a computer for data transmission?

**X. Sound Card**

**T5B - Operating controls**

**- 1 Exam Question**

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What may happen if a transmitter is operated with the microphone gain set too high?

**X. It may cause the signal to become distorted and unreadable**

-----  
What kind of information may a VHF/UHF transceiver be capable of storing in memory?

**X. All of these answers are correct**

-----  
What is one way to select a frequency on which to operate?

**X. Use the keypad or VFO knob to enter the correct frequency**

-----  
What is the purpose of the squelch control on a transceiver?

**X. It is used to quiet noise when no signal is being received**

-----  
What is a way to enable quick access to a favorite frequency on your transceiver?

**X. Store the frequency in a memory channel**

-----  
What might you do to improve the situation if the station you are listening to is hard to copy because of ignition noise interference?

**X. Turn on the noise blanker**

-----  
What is the purpose of the buttons labeled "up" and "down" on many microphones?

**X. To allow easy frequency or memory selection**

-----  
What is the purpose of the "shift" control found on many VHF/UHF transceivers?

**X. Adjust the offset between transmit and receive frequency**

-----  
What does RIT mean?

**X. Receiver Incremental Tuning**

-----  
What is the purpose of the "step" menu function found on many transceivers?

**X. It sets the tuning rate when changing frequencies**

-----  
What is the purpose of the "function" or "F" key found on many transceivers?

**X. It selects an alternate action for some control buttons**

-----

**- 1 Exam Question**

What is one purpose of a repeater?

**X. To extend the usable range of mobile and low-power stations**

What is a courtesy tone?

**X. A tone used to indicate when a transmission is complete**

Which of the following is the most important information to know before using a repeater?

**X. The repeater input and output frequencies**

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

**X. To listen for anyone wanting to break in**

What is the most common input/output frequency offset for repeaters in the 2-meter band?

**X. 0.6 MHz**

What is the most common input/output frequency offset for repeaters in the 70-centimeter band?

**X. 5.0 MHz**

What is meant by the terms input and output frequency when referring to repeater operations?

**X. The repeater receives on one frequency and transmits on another**

What is the meaning of the term simplex operation?

**X. Transmitting and receiving on the same frequency**

What is a reason to use simplex instead of a repeater?

**X. To avoid tying up the repeater when direct contact is possible**

How might you find out if you could communicate with a station using simplex instead of a repeater?

**X. Check the repeater input frequency to see if you can hear the other station**

What is the term for a series of repeaters that can be connected to one another to provide users with a wider coverage?

**X. Linked repeater system**

What is the main reason repeaters should be approved by the local frequency coordinator before being installed?

**X. Coordination minimizes interference between repeaters and makes the most efficient use of available frequencies**

Which of the following statements regarding use of repeaters is true?

**X. Access to any repeater may be limited by the repeater owner**

What term is used to describe a repeater when use is restricted to the members of a club or group?

**X. A closed repeater**

**T5D – Recognition and correction of problems, symptoms of overload and overdrive, distortion, over and under modulation, RF feedback, off frequency signals, fading and noise, problems with digital communications links**

**- 1 Exam Question**

-----  
What is meant by fundamental overload in reference to a receiver?

**X. Interference caused by very strong signals from a nearby source**

-----  
Which of the following is NOT a cause of radio frequency interference?

**X. Doppler shift**

-----  
What is the most likely cause of telephone interference from a nearby transmitter?

**X. The transmitter's signals are causing the telephone to act like a radio receiver**

-----  
What is a logical first step when attempting to cure a radio frequency interference problem in a nearby telephone?

**X. Install an RF filter at the telephone**

-----  
What should you do first if someone tells you that your transmissions are interfering with their TV reception?

**X. Make sure that your station is operating properly and that it does not cause interference to your own television**

-----  
Which of the following may be useful in correcting a radio frequency interference problem?

**X. All of these answers are correct**

-----  
What is the proper course of action to take when a neighbor reports that your radio signals are interfering with something in his home?

**X. Check your station and make sure it meets the standards of good amateur practice**

-----  
What should you do if a "Part 15" device in your neighbor's home is causing harmful interference to your amateur station?

**X. All of these answers are correct**

-----  
What could be happening if another operator tells you he is hearing a variable high-pitched whine on the signals from your mobile transmitter?

**X. The power wiring for your radio is picking up noise from the vehicle's electrical system**

-----  
What may be the problem if another operator reports that your SSB signal is very garbled and breaks up?

**X. RF energy may be getting into the microphone circuit and causing feedback**

-----  
What might be the problem if you receive a report that your signal through the repeater is distorted or weak?

**X. All of these answers are correct**

-----  
What is one of the reasons to use digital signals instead of analog signals to communicate with another station?

**X. Many digital systems can automatically correct errors caused by noise and interference**

-----

**SUBELEMENT T6 – Communications Modes and Methods: 3 Exam Questions - 3 Groups**

**T6A - Modulation modes, descriptions and bandwidth (AM, FM, SSB)**

**- 1 Exam Question**

What are phone transmissions?

**X. Voice transmissions by radio**

Which of the following is a form of amplitude modulation?

**X. Single sideband**

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

**X. A gateway**

Which type of voice modulation is most often used for long distance and weak signal contacts on the VHF and UHF bands?

**X. SSB**

Which type of modulation is most commonly used for VHF and UHF voice repeaters?

**X. FM**

Which emission type has the narrowest bandwidth?

**X. CW**

Which sideband is normally used for VHF and UHF SSB communications?

**X. Upper sideband**

What is the primary advantage of single sideband over FM for voice transmissions?

**X. SSB signals use much less bandwidth than FM signals**

What is the approximate bandwidth of a single-sideband voice signal?

**X. Between 2 and 3 kHz**

What is the approximate bandwidth of a frequency-modulated voice signal?

**X. Between 5 and 15 kHz**

What is the normal bandwidth required for a conventional fast-scan TV transmission using combined video and audio on the 70-centimeter band?

**X. About 6 MHz**

**- 1 Exam Question**

-----  
How is information transmitted between stations using Echolink?

**X. Internet**

-----  
What does the abbreviation IRLP mean?

**X. Internet Radio Linking Project**

-----  
Who may operate on the Echolink system?

**X. Any licensed amateur radio operator**

-----  
What technology do Echolink and IRLP have in common?

**X. Voice over Internet protocol**

-----  
What method is used to transfer data by IRLP?

**X. Voice over Internet protocol**

-----  
What does the term IRLP describe?

**X. A method of linking between two or more amateur stations using the Internet**

-----  
Which one of the following allows computer-to-radio linking for voice transmission?

**X. EchoLink**

-----  
What are you listening to if you hear a brief tone and then a station from Russia calling CQ on a 2-meter repeater?

**X. An Internet linked DX station**

-----  
Where might you find a list of active nodes using VoIP?

**X. A repeater directory on the Internet**

-----  
When using a portable transceiver how do you select a specific IRLP node?

**X. Use the keypad to transmit the IRLP node numbers**

-----

**- 1 Exam Question**

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

**X. Packet radio**

-----  
What does the term APRS mean?

**X. Automatic Position Reporting System**

-----  
What item is required along with your normal radio for sending automatic location reports?

**X. A global positioning system receiver**

-----  
What type of transmission is indicated by the term NTSC?

**X. A standard fast scan color television signal**

-----  
What emission mode may be used by a Technician class operator in the 219 - 220 MHz frequency range?

**X. Point-to-point digital message forwarding**

-----  
What does the abbreviation PSK mean?

**X. Phase Shift Keying**

-----  
What is PSK31?

**X. A low-rate data transmission mode that works well in noisy conditions**

-----  
What sending speed is recommended when using Morse code?

**X. Any speed at which you can reliably receive**

-----  
What is a practical reason for being able to copy CW when using repeaters?

**X. To recognize a repeater ID sent in Morse code**

-----  
What is the "Q" signal used to indicate that you are receiving interference from other stations?

**X. QRM**

-----  
What is the "Q" signal used to indicate that you are changing frequency?

**X. QSY**

-----

**SUBELEMENT T7 – Special Operations: 2 Exam Questions - 2 Groups**

**T7A – Operating in the field, radio direction finding, radio control, contests, special event stations**

**– 1 Exam Question**

What is a good thing to have when operating a hand-held transceiver away from home?

**X. One or more fully charged spare battery packs**

Which of these items would probably not be very useful to include in an emergency response kit?

**X. A 1500 watt output linear amplifier**

How can you make the signal from a hand-held radio stronger when operating in the field?

**X. Use an external antenna instead of the rubber-duck antenna**

What would be a good thing to have when operating from a location that includes lots of crowd noise?

**X. A combination headset and microphone**

What is a method used to locate sources of noise interference or jamming?

**X. Radio direction finding**

Which of these items would be the most useful for a hidden transmitter hunt?

**X. A directional antenna**

What is a popular operating activity that involves contacting as many stations as possible during a specified period of time?

**X. Contesting**

What is a grid locator?

**X. A letter-number designator assigned to a geographic location**

What is a special event station?

**X. A temporary station that operates in conjunction with an activity of special significance**

What is the maximum power allowed when transmitting telecommand signals to radio controlled models?

**X. 1 watt**

What is the station identification requirement when sending commands to a radio control model using amateur frequencies?

**X. A label indicating the licensee's call sign and address must be affixed to the transmitter**

**- 1 Exam Question**

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What class of license is required to use amateur satellites?

**X. Any amateur whose license allows them to transmit on the satellite uplink frequency** -----

-----  
How much power should you use to transmit when using an amateur satellite?

**X. The minimum amount of power needed to complete the contact**

-----  
What is something you can do when using an amateur radio satellite?

**X. Talk to amateur radio operators in other countries**

-----  
Who may make contact with an astronaut on the International Space Station using amateur radio frequencies?

**X. Any amateur with a Technician or higher class license**

-----  
What is a satellite beacon?

**X. A signal that contains information about a satellite**

-----  
What should you use to determine when you can access an amateur satellite?

**X. A satellite tracking program**

-----  
What is Doppler shift?

**X. A change in signal frequency caused by motion through space**

-----  
What is the name of the group that coordinates the building and/or launch of the largest number of amateur radio satellites?

**X. AMSAT**

-----  
What is a satellite sub-band?

**X. A portion of a band where satellite operations are permitted**

-----  
What is the satellite sub-band on 70-CM?

**X. 435 to 438 MHz**

-----  
What do the initials LEO tell you about an amateur satellite?

**X. The satellite is in a Low Earth Orbit**

**SUBELEMENT T8 – Emergency and Public Service Communications: 3 Exam Questions - 3 Groups**

**T8A - FCC declarations of an emergency, use of non-amateur equipment and frequencies, use of equipment by unlicensed persons, tactical call signs**

**- 1 Exam Question**

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

**X. Any special conditions and rules to be observed during the emergency**

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

**X. When specially authorized by the FCC, or in an actual emergency**

What should you do if you are in contact with another station and an emergency call is heard?

**X. Stop your contact immediately and take the emergency call**

What are the restrictions on amateur radio communications after the FCC has declared a communications emergency?

**X. You must avoid those frequencies dedicated to supporting the emergency unless you are participating in the relief effort**

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

**X. They are more efficient and help coordinate public-service communications**

What is legally required to restrict a frequency to emergency-only communication?

**X. An FCC declaration of a communications emergency**

Who has the exclusive use of a frequency if the FCC has not declared a communication emergency?

**X. No station has exclusive use in this circumstance**

What should you do if you hear someone reporting an emergency?

**X. Assume the emergency is real and act accordingly**

What is an appropriate way to initiate an emergency call on amateur radio?

**X. Say "Mayday, Mayday, Mayday" followed by "any station come in please" and identify your station**

What are the penalties for making a false emergency call?

**X. All of these answers are correct**

What type of communications has priority at all times in the Amateur Radio Service?

**X. Emergency communications**

When must priority be given to stations providing emergency communications?

**X. At all times and on all frequencies**

**- 1 Exam Question**

-----  
What can you do to be prepared for an emergency situation where your assistance might be needed?

**X. All of these answers are correct**

-----  
When may you use your amateur station to transmit a "SOS" or "MAYDAY" signal?

**X. When there is immediate threat to human life or property**

-----  
What is the primary function of RACES in relation to emergency activities?

**X. RACES organizations are restricted to serving local, state, and federal government emergency management agencies**

-----  
What is the primary function of ARES in relation to emergency activities?

**X. ARES supports agencies like the Red Cross, Salvation Army, and National Weather Service**

-----  
What organization must you register with before you can participate in RACES activities?

**X. The responsible civil defense organization**

-----  
What is necessary before you can join an ARES group?

**X. You must have an amateur radio license**

-----  
What could be used as an alternate source of power to operate radio equipment during emergencies?

**X. All of these answers are correct**

-----  
When can you use non-amateur frequencies or equipment to call for help in a situation involving immediate danger to life or property?

**X. In a genuine emergency you may use any means at your disposal to call for help on any frequency**

-----  
Why should casual conversation between stations during a public service event be avoided?

**X. Idle chatter may interfere with important traffic**

-----  
What should you do if a reporter asks to use your amateur radio transceiver to make a news report?

**X. Advise them that the FCC prohibits such use**

-----  
When can you use a modified amateur radio transceiver to transmit on the local fire department frequency?

**X. In a genuine emergency you may use any means at your disposal to call for help on any frequency**

-----

**- 1 Exam Question**

-----  
Which type of traffic has the highest priority?

**X. Emergency traffic**

-----  
What type of messages should not be transmitted over amateur radio frequencies during emergencies?

**X. Personal information concerning victims**

-----  
What should you do to minimize disruptions to an emergency traffic net once you have checked in?

**X. Do not transmit on the net frequency until asked to do so by the net control station**

-----  
What is one thing that must be included when passing emergency messages?

**X. The name of the person originating the message**

-----  
What is one way to reduce the chances of casual listeners overhearing sensitive emergency traffic?

**X. Pass messages using a non-voice mode such as packet radio or Morse code**

-----  
What is of primary importance for a net control station?

**X. A strong and clear signal**

-----  
What should the net control station do if someone breaks in with emergency traffic?

**X. Stop all net activity until the emergency has been handled**

-----  
What should you do if a large scale emergency has just occurred and no net control station is available?

**X. Open the emergency net immediately and ask for check-ins**

-----  
What is the preamble of a message?

**X. The information needed to track the message as it passes through the amateur radio traffic handling system**

-----  
What is meant by the term "check" in reference to a message?

**X. The check is a count of the number of words in the message**

-----  
What is the recommended guideline for the maximum number of words to be included in the text of an emergency message?

**X. 25 words**

-----

**SUBELEMENT T9 – Radio Waves, Propagation, and Antennas: 3 Exam Questions – 3 Groups**

**T9A - Antenna types – vertical, horizontal, concept of gain, common portable and mobile antennas, losses with short antennas, relationships between antenna length and frequency, dummy loads**

**- 1 Exam Question**

What is a beam antenna?

**X. An antenna that concentrates signals in one direction**

What is an antenna that consists of a single element mounted perpendicular to the Earth's surface?

**X. A vertical antenna**

What type of antenna is a simple dipole mounted so the elements are parallel to the Earth's surface?

**X. A horizontal antenna**

What is a disadvantage of the "rubber duck" antenna supplied with most hand held radio transceivers?

**X. It does not transmit or receive as effectively as a full sized antenna**

How does the physical size of half-wave dipole antenna change with operating frequency?

**X. It becomes shorter as the frequency increases**

What is the advantage of 5/8 wavelength over 1/4 wavelength vertical antennas?

**X. Their radiation pattern concentrates energy at lower angles**

What is the primary purpose of a dummy load?

**X. It does not radiate interfering signals when making tests**

What type of antennas are the quad, Yagi, and dish?

**X. Directional or beam antennas**

What is one type of antenna that offers good efficiency when operating mobile and can be easily installed or removed?

**X. A magnet mount vertical antenna**

What is a good reason not to use a "rubber duck" antenna inside your car?

**X. Signals can be 10 to 20 times weaker than when you are outside of the vehicle**

What is the approximate length, in inches, of a quarter-wavelength vertical antenna for 146 MHz?

**X. 19 inches**

What is the approximate length, in inches, of a 6-meter 1/2 wavelength wire dipole antenna?

**X. 112 inches**

**- 1 Exam Question**

Why are VHF/UHF signals not normally heard over long distances?

**X. VHF and UHF signals are usually not reflected by the ionosphere**

What might be happening when we hear a VHF signal from long distances?

**X. A possible cause is sporadic E reflection from a layer in the ionosphere**

What is the most likely cause of sudden bursts of tones or fragments of different conversations that interfere with VHF or UHF signals?

**X. Strong signals are overloading the receiver and causing undesired signals to be heard.**

What is the radio horizon?

**X. The point where radio signals between two points are blocked by the curvature of the Earth**

What should you do if a station reports that your signals were strong just a moment ago, but now they are weak or distorted?

**X. Try moving a few feet, random reflections may be causing multi-path distortion**

Why do UHF signals often work better inside of buildings than VHF signals?

**X. The shorter wavelength of UHF signals allows them to more easily penetrate urban areas and buildings**

What is a good thing to remember when using your hand-held VHF or UHF radio to reach a distant repeater?

**X. Keep the antenna as close to vertical as you can**

What can happen if the antennas at opposite ends of a VHF or UHF line of sight radio link are not using the same polarization?

**X. Signals could be as much as 100 times weaker**

What might be a way to reach a distant repeater if buildings or obstructions are blocking the direct line of sight path?

**X. Try using a directional antenna to find a path that reflects signals to the repeater**

What term is commonly used to describe the rapid fluttering sound sometimes heard from mobile stations that are moving while transmitting?

**X. Picket fencing**

Why do VHF and UHF Radio signals usually travel about a third farther than the visual line of sight distance between 2 stations?

**X. The Earth seems less curved to radio waves than to light**

**- 1 Exam Question**

-----  
What, in general terms, is standing wave ratio (SWR)?

**X. A measure of how well a load is matched to a transmitter**

-----  
What reading on a SWR meter indicates a perfect impedance match between the antenna and the feed line?

**X. 1 to 1**

-----  
What might be indicated by erratic changes in SWR readings?

**X. A loose connection in your antenna or feedline**

-----  
What is the SWR value where the protection circuits in most solid-state transmitters begin to reduce transmitter power?

**X. 2 to 1**

-----  
What happens to the power lost in a feed line?

**X. It is converted into heat by losses in the line**

-----  
What instrument other than a SWR meter could you use to determine if your feedline and antenna are properly matched?

**X. Directional wattmeter**

-----  
What is the most common reason for failure of coaxial cables?

**X. Moisture contamination**

-----  
Why is it important to have a low SWR in an antenna system that uses coaxial cable feedline?

**X. To allow the efficient transfer of power and reduce losses**

-----  
What can happen to older coaxial cables that are exposed to weather and sunlight for several years?

**X. Losses can increase dramatically**

-----  
Why is the outer sheath of most coaxial cables black in color?

**X. Black provides protection against ultraviolet damage**

-----  
What is the impedance of the most commonly used coaxial cable in typical amateur radio installations?

**X. 50 Ohms**

-----  
Why is coaxial cable used more often than any other feed line for amateur radio antenna systems?

**X. It is easy to use and requires few special installation considerations**

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**SUBELEMENT T0 – Electrical and RF Safety: 3 Exam Questions - 3 Groups**

**T0A – AC power circuits, hazardous voltages, fuses and circuit breakers, grounding, lightning protection, battery safety, electrical code compliance**

**– 1 Exam Question**

What is a commonly accepted value for the lowest voltage that can cause a dangerous electric shock?

**X. 30 volts**

What is the lowest amount of electrical current flowing through the human body that is likely to cause death?

**X. 100 milliamperes**

What is connected to the green wire in a three-wire electrical plug?

**X. Ground**

What is the purpose of a fuse in an electrical circuit?

**X. To interrupt power in case of overload**

What might happen if you install a 20-ampere fuse in your transceiver in the place of a 5-ampere fuse?

**X. Excessive current could cause a fire**

What is a good way to guard against electrical shock at your station?

**X. All of these answers are correct**

What is the most important thing to consider when installing an emergency disconnect switch at your station?

**X. Everyone should know where it is and how to use it**

What precautions should be taken when a lightning storm is expected?

**X. All of these answers are correct**

What is one way to recharge a 12-volt battery if the commercial power is out?

**X. Connect the battery to a car's battery and run the engine**

What kind of hazard is presented by a conventional 12-volt storage battery?

**X. All of these answers are correct**

What can happen if a storage battery is charged or discharged too quickly?

**X. The battery could overheat and give off dangerous gas or explode**

What is the most important reason to have a lightning protection system for your amateur radio station?

**X. Fire prevention**

What kind of hazard might exist in a power supply when it is turned off and disconnected?

**X. You might receive an electric shock from stored charge in large capacitors**

**– 1 Exam Question**

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

**X. To protect your head and eyes in case something accidentally falls from the tower**

What is a good precaution to observe before climbing an antenna tower?

**X. Put on your safety belt and safety glasses**

What should you do before you climb a tower?

**X. All of these answers are correct**

What is an important consideration when putting up an antenna?

**X. Make sure people cannot accidentally come into contact with it**

What must be considered when erecting an antenna near an airport?

**X. The maximum allowed height with regard to nearby airports**

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

**X. Look for and stay clear of any overhead electrical wires**

How should the guy wires for an antenna tower be installed?

**X. In accordance with the tower manufacturer's instructions**

What is a safe distance from a power line to allow when installing an antenna?

**X. So that if the antenna falls unexpectedly, no part of it can come closer than 10 feet to the power wires**

What is the most important safety rule to remember when using a crank-up tower?

**X. A crank-up tower should never be climbed unless it is in the fully lowered position**

Why is stainless steel hardware used on many antennas instead of other metals?

**X. Stainless steel parts are much less likely to corrode**

What is considered to be an adequate ground for a tower?

**X. Separate 8 foot long ground rods for each tower leg, bonded to the tower and each other**

**- 1 Exam Question**

-----  
What type of radiation are VHF and UHF radio signals?

**X. Non-ionizing radiation**

-----  
When can radio waves cause injury to the human body?

**X. Only if the combination of signal strength and frequency cause excessive power to be absorbed**

-----  
What is the maximum power level that an amateur radio station may use at frequencies above 30 MHz before an RF exposure evaluation is required?

**X. 50 watts PEP at the antenna**

-----  
What factors affect the RF exposure of people near an amateur transmitter?

**X. All of these answers are correct**

-----  
Why must the frequency of an RF source be considered when evaluating RF radiation exposure?

**X. The human body absorbs more RF energy at some frequencies than others**

-----  
How can you determine that your station complies with FCC RF exposure regulations?

**X. All of these choices are correct**

-----  
What could happen if a person accidentally touched your antenna while you were transmitting?

**X. They might receive a painful RF burn injury**

-----  
What action might amateur operators take to prevent exposure to RF radiation in excess of FCC supplied limits?

**X. All of these answers are correct**

-----  
How can you make sure your station stays in compliance with RF safety regulations?

**X. By re-evaluating the station whenever an item of equipment is changed**

-----  
Which of the following units of measurement is used to measure RF radiation exposure?

**X. Milliwatts per square centimeter**

-----  
Why is duty cycle one of the factors used to determine safe RF radiation exposure levels?

**X. It takes into account the amount of time the transmitter is operating**

-----

## CONGRATULATIONS! YOU HAVE SURVIVED THE QUESTION POOL.

To see when your license is issued visit <http://www.qrz.com/callsign> and click on “Name Search” or visit <http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp> and click on “amateur” in the middle column to go to the search page and search using your name. You are “legal” to operate when your name appears on-line with your new amateur callsign, which is usually 5-15 days post-exam. A paper-license will arrive in the mail later.

The best way to learn what these questions and answers really mean—and to gain the skills needed to actually be an effective amateur radio operator is to visit a local Amateur Radio Club and by getting on the air. Don’t wait for an emergency to learn your skills!

Central Georgia Amateur Radio Club (CGARC) meets at 7:30 PM on the 2nd Thursday of each month at the First Christian Church, 100 N. Houston Rd. in Warner Robins. VE testing is offered before each meeting starting at 6:30 PM. Visit our website at: <http://members.cox.net/cgarc/>

The CGARC 2 Meters Repeaters are:

146.850 (-) No tone required  
145.110 (-) No tone required

Middle Georgia Radio Association (MGRA) meets at 7:00 PM on the 3rd Thursday of each month at the Church of Christ, 1947 Watson Boulevard, Warner Robins. Visit our website at <http://www.wr4mg.org>

The MGRA Repeaters are:

147.300 (+), 107.2 Hz Tone  
224.840 (-), 107.2 Hz Tone  
442.900 (+), 107.2 Hz Tone

A good site for user product reviews, events, and over 5700 ham related links is <http://www.eham.net>

**CENTRAL GEORGIA AMATEUR RADIO EMERGENCY SERVICE NET EVERY MONDAY  
AT 7:00PM ON THE 145.110 (-) LINKED TO THE 146.850 (-) MARK IT ON YOUR  
SCHEDULE WEEKLY!**

**FOR MORE INFORMATION ON THIS GUIDE PLEASE CONTACT DR. WIL @ 770-  
490-0022 OR NM4W@LIVE.COM**