

# Technician Class Question Pool

Questions and correct answers only

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By K8TB last edited 5-15-2018

## **SUBELEMENT T1-FCC Rules, descriptions and definitions for the amateur radio service, operator and station license responsibilities [6 Exam Questions – 6 Groups]**

Which of the following is a purpose of the Amateur Radio Service as stated in the FCC rules and regulations?

**Advancing skills in the technical and communication phases of the radio art**

Which agency regulates and enforces the rules for the Amateur Radio Service in the United States?

**The FCC**

What are the FCC rules regarding the use of a phonetic alphabet for station identification in the Amateur Radio Service?

**It is encouraged**

How many operator/primary station license grants may be held by any one person?

**One**

What is proof of possession of an FCC-issued operator/primary license grant?

**The control operator's operator/primary station license must appear in the FCC ULS consolidated licensee database**

What is the FCC Part 97 definition of a beacon?

**An amateur station transmitting communications for the purposes of observing propagation or related experimental activities**

What is the FCC Part 97 definition of a space station?

**An amateur station located more than 50 km above the Earth's surface**

Which of the following entities recommends transmit/receive channels and other parameters for auxiliary and repeater stations?

**Volunteer Frequency Coordinator recognized by local amateurs**

Who selects a Frequency Coordinator?

**Amateur operators in a local or regional area whose stations are eligible to be repeater or auxiliary stations**

Which of the following describes the Radio Amateur Civil Emergency Service (RACES)?

**-A radio service using amateur frequencies for emergency management or civil defense communications**

**-A radio service using amateur stations for emergency management or civil defense communications**

**-An emergency service using amateur operators certified by a civil defense organization as being enrolled in that organization**

**All of these choices are correct**

When is willful interference to other amateur radio stations permitted?

**At no time**

What is the International Telecommunications Union (ITU)?

**A United Nations agency for information and communication technology issues**

Which amateur radio stations may make contact with an amateur radio station on the **International Space Station (ISS) using 2 meter and 70 cm band frequencies?**  
**Any amateur holding a Technician or higher-class license**

Which frequency is within the 6 meter amateur band?  
**52.525 MHz**

Which amateur band are you using when your station is transmitting on 146.52 MHz?  
**2 meter band**

What is the limitation for emissions on the frequencies between 219 and 220 MHz?  
**Fixed digital message forwarding systems only**

On which HF bands does a Technician class operator have phone privileges?  
**10 meter band only**

Which of the following VHF/UHF frequency ranges are limited to CW only?  
**50.0 MHz to 50.1 MHz and 144.0 MHz to 144.1 MHz**

Which of the following is a result of the fact that the Amateur Radio Service is secondary in all or portions of some amateur bands (such as portions of the 70 cm band)?  
**U.S. amateurs may find non-amateur stations in those portions, and must avoid interfering with them**

Why should you not set your transmit frequency to be exactly at the edge of an amateur band or sub-band?  
-To allow for calibration error in the transmitter frequency display  
-So that modulation sidebands do not extend beyond the band edge  
-To allow for transmitter frequency drift  
**All of these choices are correct**

Which of the following HF bands have frequencies available to the Technician class operator for RTTY and data transmissions?  
**10 meter band only**

What is the maximum peak envelope power output for Technician class operators using their assigned portions of the HF bands?  
**200 watts**

Except for some specific restrictions, what is the maximum peak envelope power output for Technician class operators using frequencies above 30 MHz?  
**1500 watts**

For which license classes are new licenses currently available from the FCC?  
**Technician, General, Amateur Extra**

Who may select a desired call sign under the vanity call sign rules?  
**Any licensed amateur**

What types of international communications is an FCC-licensed amateur radio station permitted to make?  
**Communications incidental to the purposes of the Amateur Radio Service and remarks of a personal character**

When are you allowed to operate your amateur station in a foreign country?  
**When the foreign country authorizes it**

Which of the following is a valid call sign for a Technician class amateur radio station?

-K1XXX

-KA1X

-W1XX

**All of these choices are correct**

From which of the following locations may an FCC-licensed amateur station transmit?

**From any vessel or craft located in international waters and documented or registered in the United States**

What may result when correspondence from the FCC is returned as undeliverable because the grantee failed to provide and maintain a correct mailing address with the FCC?

**Revocation of the station license or suspension of the operator license**

What is the normal term for an FCC-issued primary station/operator amateur radio license grant?

**Ten years**

What is the grace period following the expiration of an amateur license within which the license may be renewed?

**Two years**

How soon after passing the examination for your first amateur radio license may you operate a transmitter on an Amateur Radio Service frequency?

**As soon as your operator/station license grant appears in the FCC's license database**

If your license has expired and is still within the allowable grace period, may you continue to operate a transmitter on Amateur Radio Service frequencies?

**No, transmitting is not allowed until the FCC license database shows that the license has been renewed**

With which countries are FCC-licensed amateur radio stations prohibited from exchanging communications?

**Any country whose administration has notified the International Telecommunications Union (ITU) that it objects to such communications**

Under which of the following circumstances may an amateur radio station make one-way transmissions?

**When transmitting code practice, information bulletins, or transmissions necessary to provide emergency communications**

When is it permissible to transmit messages encoded to hide their meaning?

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

Under what conditions is an amateur station authorized to transmit music using a phone emission?

**When incidental to an authorized retransmission of manned spacecraft communications**

When may amateur radio operators use their stations to notify other amateurs of the availability of equipment for sale or trade?

**When the equipment is normally used in an amateur station and such activity is not conducted on a regular basis**

What, if any, are the restrictions concerning transmission of language that may be considered indecent or obscene?

**Any such language is prohibited**

What types of amateur stations can automatically retransmit the signals of other amateur stations?

**Repeater, auxiliary, or space stations**

In which of the following circumstances may the control operator of an amateur station receive compensation for operating that station?

**When the communication is incidental to classroom instruction at an educational institution**

Under which of the following circumstances are amateur stations authorized to transmit signals related to broadcasting, program production, or news gathering, assuming no other means is available?

**Only where such communications directly relate to the immediate safety of human life or protection of property**

What is the meaning of the term broadcasting in the FCC rules for the Amateur Radio Service?

**Transmissions intended for reception by the general public**

When may an amateur station transmit without on-the-air identification?

**When transmitting signals to control model craft**

When is an amateur station permitted to transmit without a control operator?

**Never**

Who may be the control operator of a station communicating through an amateur satellite or space station?

**Any amateur whose license privileges allow them to transmit on the satellite uplink frequency**

Who must designate the station control operator?

**The station licensee**

What determines the transmitting privileges of an amateur station?

**The class of operator license held by the control operator**

What is an amateur station control point?

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

When, under normal circumstances, may a Technician class licensee be the control operator of a station operating in an exclusive Amateur Extra class operator segment of the amateur bands?

**At no time**

When the control operator is not the station licensee, who is responsible for the proper operation of the station?

**The control operator and the station licensee are equally responsible**

Which of the following is an example of automatic control?

**Repeater operation**

Which of the following is true of remote control operation?

- The control operator must be at the control point
  - A control operator is required at all times
  - The control operator indirectly manipulates the controls
- All of these choices are correct**

Which of the following is an example of remote control as defined in Part 97?

**Operating the station over the internet**

Who does the FCC presume to be the control operator of an amateur station, unless documentation to the contrary is in the station records?

**The station licensee**

When must the station licensee make the station and its records available for FCC inspection?

**At any time upon request by an FCC representative**

When using tactical identifiers such as "Race Headquarters" during a community service net operation, how often must your station transmit the station's FCC-assigned call sign?

**At the end of each communication and every ten minutes during a communication**

When is an amateur station required to transmit its assigned call sign?

**At least every 10 minutes during and at the end of a communication**

Which of the following is an acceptable language to use for station identification when operating in a phone sub-band?

**The English language**

What method of call sign identification is required for a station transmitting phone signals?

**Send the call sign using a CW or phone emission**

Which of the following formats of a self-assigned indicator is acceptable when identifying using a phone transmission?

- KL7CC stroke W3
- KL7CC slant W3
- KL7CC slash W3

**All of these choices are correct**

Which of the following restrictions apply when a non-licensed person is allowed to speak to a foreign station using a station under the control of a Technician class control operator?

**The foreign station must be one with which the U.S. has a third-party agreement**

What is meant by the term Third Party Communications?

**A message from a control operator to another amateur station control operator on behalf of another person**

What type of amateur station simultaneously retransmits the signal of another amateur station on a different channel or channels?

**Repeater station**

Who is accountable should a repeater inadvertently retransmit communications that violate the FCC rules?

**The control operator of the originating station**

Which of the following is a requirement for the issuance of a club station license grant?

**The club must have at least four members**

### **SUBELEMENT T2 - Operating Procedures - [3 Exam Questions - 3 Groups]**

Which of the following is a common repeater frequency offset in the 2 meter band?

**Plus or minus 600 kHz**

What is the national calling frequency for FM simplex operations in the 2 meter band?

**146.520 MHz**

What is a common repeater frequency offset in the 70 cm band?

**Plus or minus 5 MHz**

What is an appropriate way to call another station on a repeater if you know the other station's call sign?

**Say the station's call sign, then identify with your call sign**

How should you respond to a station calling CQ?

**Transmit the other station's call sign followed by your call sign**

Which of the following is required when making on-the-air test transmissions?

**Identify the transmitting station**

What is meant by "repeater offset?"

**The difference between a repeater's transmit frequency and its receive frequency**

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

**Calling any station**

What brief statement indicates that you are listening on a repeater and looking for a contact?

**Your call sign**

What is a band plan, beyond the privileges established by the FCC?

**A voluntary guideline for using different modes or activities within an amateur band**

What term describes an amateur station that is transmitting and receiving on the same frequency?

**Simplex**

Which of the following is a guideline when choosing an operating frequency for calling CQ?

**-Listen first to be sure that no one else is using the frequency**

**-Ask if the frequency is in use**

**-Make sure you are in your assigned band**

**All of these choices are correct**

What is the most common use of the "reverse split" function of a VHF/UHF transceiver?

**Listen on a repeater's input frequency**

What term describes the use of a sub-audible tone transmitted along with normal voice audio to open the squelch of a receiver?

**CTCSS**

If a station is not strong enough to keep a repeater's receiver squelch open, which of the following might allow you to receive the station's signal?

**Listen on the repeater input frequency**

Which of the following could be the reason you are unable to access a repeater whose output you can hear?

-Improper transceiver offset

-The repeater may require a proper CTCSS tone from your transceiver

-The repeater may require a proper DCS tone from your transceiver

**All of these choices are correct**

What might be the problem if a repeater user says your transmissions are breaking up on voice peaks?

**You are talking too loudly**

What type of tones are used to control repeaters linked by the Internet Relay Linking Project (IRLP) protocol?

**DTMF**

How can you join a digital repeater's "talk group"?

**Program your radio with the group's ID or code**

Which of the following applies when two stations transmitting on the same frequency interfere with each other?

**Common courtesy should prevail, but no one has absolute right to an amateur frequency**

What is a "talk group" on a DMR digital repeater?

**A way for groups of users to share a channel at different times without being heard by other users on the channel**

Which Q signal indicates that you are receiving interference from other stations?

**QRM**

Which Q signal indicates that you are changing frequency?

**QSY**

Why are simplex channels designated in the VHF/UHF band plans?

**So that stations within mutual communications range can communicate without tying up a repeater**

Where may SSB phone be used in amateur bands above 50 MHz?

**In at least some portion of all these bands**

Which of the following describes a linked repeater network?

**A network of repeaters where signals received by one repeater are repeated by all the repeaters**

When do the FCC rules NOT apply to the operation of an amateur station?

**Never, FCC rules always apply**

What is meant by the term "NCS" used in net operation?

**Net Control Station**

What should be done when using voice modes to ensure that voice messages containing unusual words are received correctly?

**Spell the words using a standard phonetic alphabet**

What do RACES and ARES have in common?

**Both organizations may provide communications during emergencies**

What does the term "traffic" refer to in net operation?

**Formal messages exchanged by net stations**

Which of the following is an accepted practice to get the immediate attention of a net control station when reporting an emergency?

**Begin your transmission by saying "Priority" or "Emergency" followed by your call sign**

Which of the following is an accepted practice for an amateur operator who has checked into a net?

**Remain on frequency without transmitting until asked to do so by the net control station**

Which of the following is a characteristic of good traffic handling?

**Passing messages exactly as received**

Are amateur station control operators ever permitted to operate outside the frequency privileges of their license class?

**Yes, but only if necessary in situations involving the immediate safety of human life or protection of property**

What information is contained in the preamble of a formal traffic message?

**The information needed to track the message**

What is meant by the term "check," in reference to a formal traffic message?

**The number of words or word equivalents in the text portion of the message**

What is the Amateur Radio Emergency Service (ARES)?

**Licensed amateurs who have voluntarily registered their qualifications and equipment for communications duty in the public service**

### **SUBELEMENT T3 – Radio wave characteristics: properties of radio waves; propagation modes – [3 Exam Questions - 3 Groups]**

What should you do if another operator reports that your station's 2 meter signals were strong just a moment ago, but now they are weak or distorted?

**Try moving a few feet or changing the direction of your antenna if possible, as reflections may be causing multi-path distortion**

Why might the range of VHF and UHF signals be greater in the winter?

**Less absorption by vegetation**

A03 (C)

What antenna polarization is normally used for long-distance weak-signal CW and SSB contacts using the VHF and UHF bands?

**Horizontal**



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?

**Signals could be significantly weaker**

When using a directional antenna, how might your station be able to access a distant repeater if buildings or obstructions are blocking the direct line of sight path?

**Try 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?

**Picket fencing**

What type of wave carries radio signals between transmitting and receiving stations?

**Electromagnetic**

Which of the following is a likely cause of irregular fading of signals received by ionospheric reflection?

**Random combining of signals arriving via different paths**

Which of the following results from the fact that skip signals refracted from the ionosphere are elliptically polarized?

**Either vertically or horizontally polarized antennas may be used for transmission or reception**

What may occur if data signals arrive via multiple paths?

**Error rates are likely to increase**

Which part of the atmosphere enables the propagation of radio signals around the world?

**The ionosphere**

How might fog and light rain affect radio range on the 10 meter and 6 meter bands?

**Fog and light rain will have little effect on these bands**

What weather condition would decrease range at microwave frequencies?

**Precipitation**

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

**Wavelength**

What property of a radio wave is used to describe its polarization?

**The orientation of the electric field**

What are the two components of a radio wave?

**Electric and magnetic fields**

How fast does a radio wave travel through free space?

**At the speed of light**

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

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

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

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

What property of radio waves is often used to identify the different frequency bands??

**The approximate wavelength**

What are the frequency limits of the VHF spectrum?

**30 to 300 MHz**

What are the frequency limits of the UHF spectrum?

**300 to 3000 MHz**

What frequency range is referred to as HF?

**3 to 30 MHz**

What is the approximate velocity of a radio wave as it travels through free space?

**300,000,000 meters per second**

Why are direct (not via a repeater) UHF signals rarely heard from stations outside your local coverage area?

**UHF signals are usually not reflected by the ionosphere**

Which of the following is an advantage of HF vs VHF and higher frequencies?

**Long distance ionospheric propagation is far more common on HF**

What is a characteristic of VHF signals received via auroral reflection?

**The signals exhibit rapid fluctuations of strength and often sound distorted**

Which of the following propagation types is most commonly associated with occasional strong over-the-horizon signals on the 10, 6, and 2 meter bands?

**Sporadic E**

Which of the following effects might cause radio signals to be heard despite obstructions between the transmitting and receiving stations?

**Knife-edge diffraction**

What mode is responsible for allowing over-the-horizon VHF and UHF communications to ranges of approximately 300 miles on a regular basis?

**Tropospheric ducting**

What band is best suited for communicating via meteor scatter?

**6 meter band**

What causes tropospheric ducting?

**Temperature inversions in the atmosphere**

What is generally the best time for long-distance 10 meter band propagation via the F layer?

**From dawn to shortly after sunset during periods of high sunspot activity**

Which of the following bands may provide long distance communications during the peak of the sunspot cycle?

**6 or 10 meter bands**

Why do VHF and UHF radio signals usually travel somewhat farther than the visual line of sight distance between two stations??

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

#### **SUBELEMENT T4 - Amateur radio practices and station set-up – [2 Exam Questions - 2 Groups]**

What must be considered to determine the minimum current capacity needed for a transceiver power supply?

- Efficiency of the transmitter at full power output
- Receiver and control circuit power
- Power supply regulation and heat dissipation

**All of these choices are correct**

How might a computer be used as part of an amateur radio station?

- For logging contacts and contact information
- For sending and/or receiving CW
- For generating and decoding digital signals

**All of these choices are correct**

Why should wiring between the power source and radio be heavy-gauge wire and kept as short as possible?

**To avoid voltage falling below that needed for proper operation**

Which computer sound card port is connected to a transceiver's headphone or speaker output for operating digital modes?

**Microphone or line input**

What is the proper location for an external SWR meter?

**In series with the feed line, between the transmitter and antenna**

Which of the following connections might be used between a voice transceiver and a computer for digital operation?

**Receive audio, transmit audio, and push-to-talk (PTT)**

How is a computer's sound card used when conducting digital communications?

**The sound card provides audio to the radio's microphone input and converts received audio to digital form**

Which of the following conductors provides the lowest impedance to RF signals?

**Flat strap**

Which of the following could you use to cure distorted audio caused by RF current on the shield of a microphone cable?

**Ferrite choke**

What is the source of a high-pitched whine that varies with engine speed in a mobile transceiver's receive audio?

**The alternator**

Where should the negative return connection of a mobile transceiver's power cable be connected?

**At the battery or engine block ground strap**

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

**The output signal might become distorted**

Which of the following can be used to enter the operating frequency on a modern transceiver?

**The keypad or VFO knob**

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

**To mute receiver output noise when no signal is being received**

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

**Store the frequency in a memory channel**

Which of the following would reduce ignition interference to a receiver?

**Turn on the noise blanker**

Which of the following controls could be used if the voice pitch of a single-sideband signal seems too high or low?

**The receiver RIT or clarifier**

What does the term "RIT" mean?

**Receiver Incremental Tuning**

What is the advantage of having multiple receive bandwidth choices on a multimode transceiver?

**Permits noise or interference reduction by selecting a bandwidth matching the mode**

Which of the following is an appropriate receive filter bandwidth for minimizing noise and interference for SSB reception?

**2400 Hz**

Which of the following is an appropriate receive filter bandwidth for minimizing noise and interference for CW reception?

**500 Hz**

What is the function of automatic gain control, or AGC?

**To keep received audio relatively constant**

Which of the following could be used to remove power line noise or ignition noise?

**Noise blanker**

Which of the following is a use for the scanning function of an FM transceiver?

**To scan through a range of frequencies to check for activity**

#### **SUBELEMENT T5 – Electrical principles: math for electronics; electronic principles; Ohm's Law – [4 Exam Questions - 4 Groups]**

Electrical current is measured in which of the following units?

**Amperes**

Electrical power is measured in which of the following units?

**Watts**

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

**Current**

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

**Direct current**

What is the electrical term for the electromotive force (EMF) that causes electron flow?

**Voltage**

How much voltage does a mobile transceiver typically require?

**About 12 volts**

Which of the following is a good electrical conductor?

**Copper**

Which of the following is a good electrical insulator?

**Glass**

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

**Alternating current**

Which term describes the rate at which electrical energy is used?

**Power**

What is the unit of electromotive force?

**The volt**

What describes the number of times per second that an alternating current makes a complete cycle?

**Frequency**

In which type of circuit is current the same through all components?

**Series**

In which type of circuit is voltage the same across all components?

**Parallel**

How many milliamperes is 1.5 amperes?

**1500 milliamperes**

What is another way to specify a radio signal frequency of 1,500,000 hertz?

**1500 kHz**

How many volts are equal to one kilovolt?

**One thousand volts**

How many volts are equal to one microvolt?

**One one-millionth of a volt**

T5B05 (B) Which of the following is equal to 500 milliwatts?

**0.5 watts**

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

**3 amperes**

If a frequency display calibrated in megahertz shows a reading of 3.525 MHz, what would it show if it were calibrated in kilohertz?

**3525 kHz**

How many microfarads are equal to 1,000,000 picofarads?

**1 microfarad**

What is the approximate amount of change, measured in decibels (dB), of a power increase from 5 watts to 10 watts?

**3 dB**

T5B10 (C)

What is the approximate amount of change, measured in decibels (dB), of a power decrease from 12 watts to 3 watts?

**-6 dB**

What is the amount of change, measured in decibels (dB), of a power increase from 20 watts to 200 watts?

**10 dB**

Which of the following frequencies is equal to 28,400 kHz?

**28.400 MHz**

If a frequency display shows a reading of 2425 MHz, what frequency is that in GHz?

**2.425 GHz**

What is the ability to store energy in an electric field called?

**Capacitance**

What is the basic unit of capacitance?

**The farad**

What is the ability to store energy in a magnetic field called?

**Inductance**

What is the basic unit of inductance?

**The henry**

What is the unit of frequency?

**Hertz**

What does the abbreviation "RF" refer to?

**Radio frequency signals of all types**

A radio wave is made up of what type of energy?

**Electromagnetic**

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

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

How much power is being used in a circuit when the applied voltage is 13.8 volts DC and the current is 10 amperes?

**138 watts**

How much power is being used in a circuit when the applied voltage is 12 volts DC and the current is 2.5 amperes?

**30 watts**

How many amperes are flowing in a circuit when the applied voltage is 12 volts DC and the load is 120 watts?

**10 amperes**

What is impedance?

**A measure of the opposition to AC current flow in a circuit**

What is a unit of impedance?

**Ohms**

What is the proper abbreviation for megahertz?

**MHz**

What formula is used to calculate current in a circuit?

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

What formula is used to calculate voltage in a circuit?

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

What formula is used to calculate resistance in a circuit?

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

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

**30 ohms**

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

**8 ohms**

What is the resistance of a circuit that draws 4 amperes from a 12-volt source?

**3 ohms**

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

**1.5 amperes**

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

**2 amperes**

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

**10 amperes**

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

**1 volt**

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

**10 volts**

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

**20 volts**

What happens to current at the junction of two components in series?

**It is unchanged**

What happens to current at the junction of two components in parallel?

**It divides between them dependent on the value of the components**

What is the voltage across each of two components in series with a voltage source?

**It is determined by the type and value of the components**

What is the voltage across each of two components in parallel with a voltage source?

**The same voltage as the source**

#### **SUBELEMENT T6 – Electrical components; circuit diagrams; component functions – [4 Exam Questions - 4 Groups]**

T6A01 (B) What electrical component opposes the flow of current in a DC circuit?

**Resistor**

What type of component is often used as an adjustable volume control?

**Potentiometer**

What electrical parameter is controlled by a potentiometer?

**Resistance**

What electrical component stores energy in an electric field?

**Capacitor**

What type of electrical component consists of two or more conductive surfaces separated by an insulator?

**Capacitor**

What type of electrical component stores energy in a magnetic field?

**Inductor**

What electrical component usually is constructed as a coil of wire?

**Inductor**

What electrical component is used to connect or disconnect electrical circuits?

**Switch**

What electrical component is used to protect other circuit components from current overloads?

**Fuse**

Which of the following battery types is rechargeable?

-Nickel-metal hydride

-Lithium-ion

-Lead-acid gel-cell

**All of these choices are correct**

Which of the following battery types is not rechargeable?

**Carbon-zinc**

What class of electronic components uses a voltage or current signal to control current flow?

**Transistors**

What electronic component allows current to flow in only one direction?

**Diode**

Which of these components can be used as an electronic switch or amplifier?

**Transistor**



Which of the following components can consist of three layers of semiconductor material?

**Transistor**

Which of the following electronic components can amplify signals?

**Transistor**

How is the cathode lead of a semiconductor diode often marked on the package?

**With a stripe**

What does the abbreviation LED stand for?

**Light Emitting Diode**

What does the abbreviation FET stand for?

**Field Effect Transistor**

What are the names of the two electrodes of a diode?

**Anode and cathode**

Which of the following could be the primary gain-producing component in an RF power amplifier?

**Transistor**

What is the term that describes a device's ability to amplify a signal?

**Gain**

What is the name of an electrical wiring diagram that uses standard component symbols?

**Schematic**

What is component 1 in figure T1?

**Resistor**

What is component 2 in figure T1?

**Transistor**

What is component 3 in figure T1?

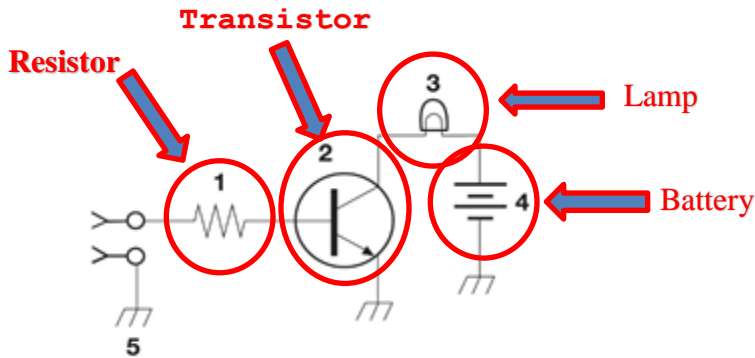
**Lamp**

What is component 4 in figure T1?

**Battery**

What is the function of component 2 in Figure T1?

**Control the flow of current**



**Figure T-1**

What is component 6 in figure T2?

**Capacitor**

What is component 8 in figure T2?

**Light emitting diode**

What is component 9 in figure T2?

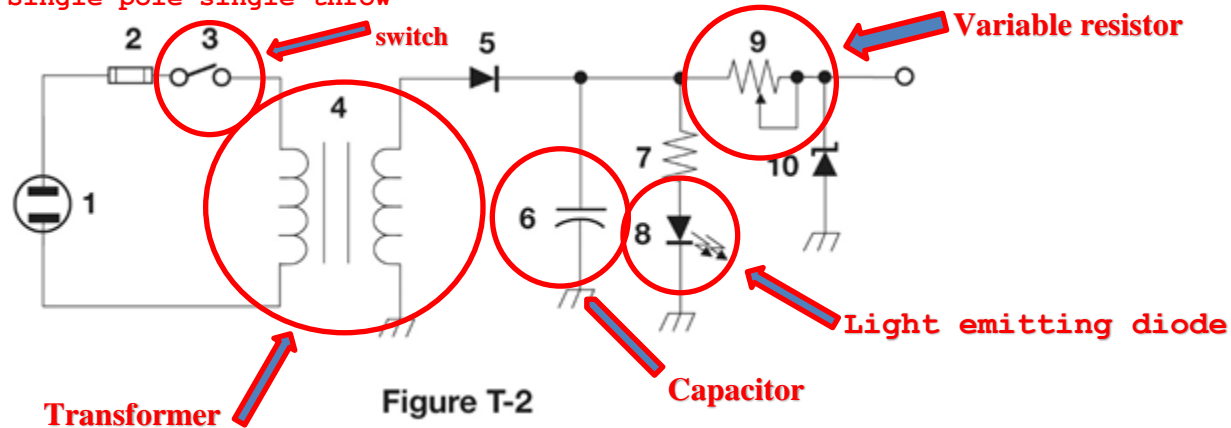
**Variable resistor**

What is component 4 in figure T2?

**Transformer**

What type of switch is represented by component 3 in figure T2?

**Single-pole single-throw**



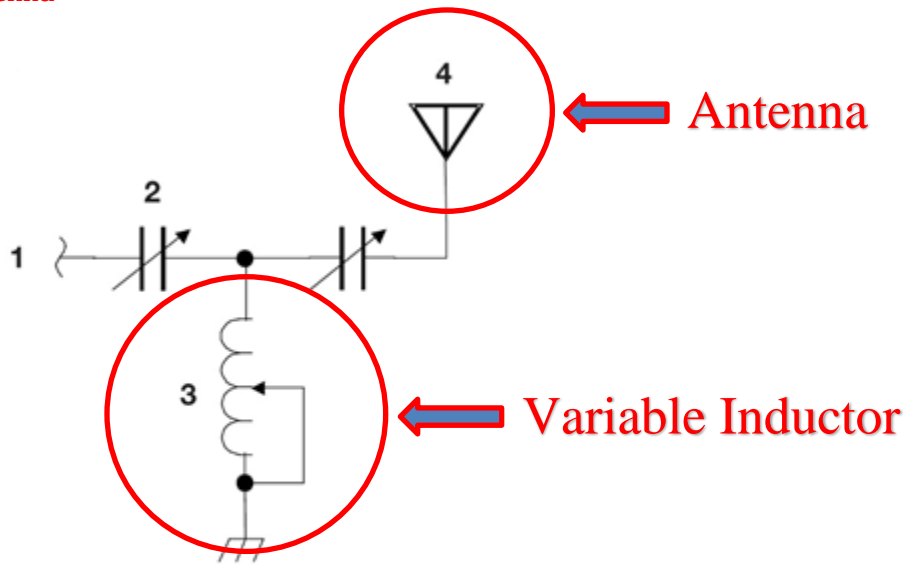
**Figure T-2**

What is component 3 in figure T3?

**Variable inductor**

What is component 4 in figure T3?

**Antenna**



**Figure T-3**

What do the symbols on an electrical schematic represent?

**Electrical components**

Which of the following is accurately represented in electrical schematics?

**The way components are interconnected**

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

**Rectifier**

What is a relay?

**An electrically-controlled switch**

Which of the following displays an electrical quantity as a numeric value?

**Meter**

What type of circuit controls the amount of voltage from a power supply?

**Regulator**

What component is commonly used to change 120V AC house current to a lower AC voltage for other uses?

**Transformer**

Which of the following is commonly used as a visual indicator?

**LED**

Which of the following is combined with an inductor to make a tuned circuit??

**Capacitor**

What is the name of a device that combines several semiconductors and other components into one package?

**Integrated circuit**

Which of the following is a resonant or tuned circuit?

**An inductor and a capacitor connected in series or parallel to form a filter**

Which of the following is a common reason to use shielded wire?

**To prevent coupling of unwanted signals to or from the wire**

### **SUBELEMENT T7 – Station equipment: common transmitter and receiver problems; antenna measurements; troubleshooting; basic repair and testing – [4 Exam Questions - 4 Groups]**

Which term describes the ability of a receiver to detect the presence of a signal?

**Sensitivity**

What is a transceiver?

**A unit combining the functions of a transmitter and a receiver**

Which of the following is used to convert a radio signal from one frequency to another?

**Mixer**

Which term describes the ability of a receiver to discriminate between multiple signals?

**Selectivity**

What is the name of a circuit that generates a signal at a specific frequency?

**Oscillator**

What device converts the RF input and output of a transceiver to another band?

**Transverter**

What is meant by "PTT"?

**The push-to-talk function that switches between receive and transmit**

Which of the following describes combining speech with an RF carrier signal?

**Modulation**

What is the function of the SSB/CW-FM switch on a VHF power amplifier?

**Set the amplifier for proper operation in the selected mode**

What device increases the low-power output from a handheld transceiver?

**An RF power amplifier**

Where is an RF preamplifier installed?

**Between the antenna and receiver**

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

**Talk farther away from the microphone**

What would cause a broadcast AM or FM radio to receive an amateur radio transmission unintentionally?

**The receiver is unable to reject strong signals outside the AM or FM band**

Which of the following can cause radio frequency interference?

-Fundamental overload

-Harmonics

-Spurious emissions

**All of these choices are correct**

Which of the following is a way to reduce or eliminate interference from an amateur transmitter to a nearby telephone?

**Put an RF filter on the telephone**

How can overload of a non-amateur radio or TV receiver by an amateur signal be reduced or eliminated?

**Block the amateur signal with a filter at the antenna input of the affected receiver**

Which of the following actions should you take if a neighbor tells you that your station's transmissions are interfering with their radio or TV reception?

**Make sure that your station is functioning properly and that it does not cause interference to your own radio or television when it is tuned to the same channel**

Which of the following can reduce overload to a VHF transceiver from a nearby FM broadcast station?

**Band-reject filter**

What should you do if something in a neighbor's home is causing harmful interference to your amateur station?

**All of these choices are correct**

What is a Part 15 device?

**An unlicensed device that may emit low-powered radio signals on frequencies used by a licensed service**

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

-Your transmitter is slightly off frequency

-Your batteries are running low

-You are in a bad location

**All of these choices are correct**

What is a symptom of RF feedback in a transmitter or transceiver?

**Reports of garbled, distorted, or unintelligible voice transmissions**

What should be the first step to resolve cable TV interference from your ham radio transmission?

**Be sure all TV coaxial connectors are installed properly**

What is the primary purpose of a dummy load?

**To prevent transmitting signals over the air when making tests**

Which of the following instruments can be used to determine if an antenna is resonant at the desired operating frequency?

**An antenna analyzer**

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

**A measure of how well a load is matched to a transmission line**

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

**1 to 1**

Why do most solid-state amateur radio transmitters reduce output power as SWR increases?

**To protect the output amplifier transistors**

What does an SWR reading of 4:1 indicate?

**Impedance mismatch**

What happens to power lost in a feed line?

**It is converted into heat**

What instrument other than an SWR meter could you use to determine if a feed line and antenna are properly matched?

**Directional wattmeter**

Which of the following is the most common cause for failure of coaxial cables?

**Moisture contamination**

Why should the outer jacket of coaxial cable be resistant to ultraviolet light?

**Ultraviolet light can damage the jacket and allow water to enter the cable**

What is a disadvantage of air core coaxial cable when compared to foam or solid dielectric types?

**It requires special techniques to prevent water absorption**

What does a dummy load consist of?

**A non-inductive resistor and a heat sink**

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

**A voltmeter**

What is the correct way to connect a voltmeter to a circuit?

**In parallel with the circuit**

How is a simple ammeter connected to a circuit?

**In series with the circuit**

Which instrument is used to measure electric current?

**An ammeter**

What instrument is used to measure resistance?

**An ohmmeter**

Which of the following might damage a multimeter?

**Attempting to measure voltage when using the resistance setting**

Which of the following measurements are commonly made using a multimeter?

**Voltage and resistance**

Which of the following types of solder is best for radio and electronic use?

**Rosin-core solder**

What is the characteristic appearance of a cold solder joint?

**A grainy or dull surface**

What is probably happening when an ohmmeter, connected across an unpowered circuit, initially indicates a low resistance and then shows increasing resistance with time?

**The circuit contains a large capacitor**

Which of the following precautions should be taken when measuring circuit resistance with an ohmmeter?

**Ensure that the circuit is not powered**

Which of the following precautions should be taken when measuring high voltages with a voltmeter?

**Ensure that the voltmeter and leads are rated for use at the voltages to be measured**

### **SUBELEMENT T8 – Modulation modes: amateur satellite operation; operating activities; non-voice and digital communications – [4 Exam Questions - 4 Groups]**

Which of the following is a form of amplitude modulation?

**Single sideband**

What type of modulation is most commonly used for VHF packet radio transmissions?

**FM**

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

**SSB**

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

**FM**

Which of the following types of emission has the narrowest bandwidth?

**CW**

Which sideband is normally used for 10 meter HF, VHF, and UHF single-sideband communications?

**Upper sideband**

What is an advantage of single sideband (SSB) over FM for voice transmissions?

**SSB signals have narrower bandwidth**

What is the approximate bandwidth of a single sideband (SSB) voice signal?

**3 kHz**

What is the approximate bandwidth of a VHF repeater FM phone signal?

**Between 10 and 15 kHz**

What is the typical bandwidth of analog fast-scan TV transmissions on the 70 centimeter band?

**About 6 MHz**

What is the approximate maximum bandwidth required to transmit a CW signal?

**150 Hz**

What telemetry information is typically transmitted by satellite beacons?

**Health and status of the satellite**

What is the impact of using too much effective radiated power on a satellite uplink?

**Blocking access by other users**

Which of the following are provided by satellite tracking programs?

- Maps showing the real-time position of the satellite track over the earth
- The time, azimuth, and elevation of the start, maximum altitude, and end of a pass
- The apparent frequency of the satellite transmission, including effects of Doppler shift

**All of these choices are correct**

What mode of transmission is commonly used by amateur radio satellites?

- SSB
- FM
- CW/data

**All of these choices are correct**

What is a satellite beacon?

**A transmission from a satellite that contains status information**

Which of the following are inputs to a satellite tracking program?

**The Keplerian elements**

With regard to satellite communications, what is Doppler shift?

**An observed change in signal frequency caused by relative motion between the satellite and the earth station**

What is meant by the statement that a satellite is operating in mode U/V?

**The satellite uplink is in the 70 centimeter band and the downlink is in the 2 meter band**

What causes spin fading of satellite signals?

**Rotation of the satellite and its antennas**

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

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

Who may receive telemetry from a space station?

**Anyone who can receive the telemetry signal**

Which of the following is a good way to judge whether your uplink power is neither too low nor too high?

**Your signal strength on the downlink should be about the same as the beacon**

Which of the following methods is used to locate sources of noise interference or jamming?

**Radio direction finding**

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

**A directional antenna**



What operating activity involves contacting as many stations as possible during a specified period?

**Contesting**

Which of the following is good procedure when contacting another station in a radio contest?

**Send only the minimum information needed for proper identification and the contest exchange**

What is a grid locator?

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

How is access to some IRLP nodes accomplished?

**By using DTMF signals**

What is meant by Voice Over Internet Protocol (VoIP) as used in amateur radio?

**A method of delivering voice communications over the internet using digital techniques**

What is the Internet Radio Linking Project (IRLP)?

**A technique to connect amateur radio systems, such as repeaters, via the internet using Voice Over Internet Protocol (VoIP)**

How might you obtain a list of active nodes that use VoIP?

-By subscribing to an on line service

-From on line repeater lists maintained by the local repeater frequency coordinator

-From a repeater directory

**All of these choices are correct**

What must be done before you may use the EchoLink system to communicate using a repeater?

**You must register your call sign and provide proof of license**

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

**A gateway**

Which of the following is a digital communications mode?

-Packet radio

-IEEE 802.11

-JT65

**All of these choices are correct**

What does the term "APRS" mean?

**Automatic Packet Reporting System**

Which of the following devices is used to provide data to the transmitter when sending automatic position reports from a mobile amateur radio station?

**A Global Positioning System receiver**

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

**An analog fast scan color TV signal**

Which of the following is an application of APRS (Automatic Packet Reporting System)?

**Providing real-time tactical digital communications in conjunction with a map showing the locations of stations**

What does the abbreviation "PSK" mean?

**Phase Shift Keying**

Which of the following best describes DMR (Digital Mobile Radio)?

**A technique for time-multiplexing two digital voice signals on a single 12.5 kHz repeater channel**

Which of the following may be included in packet transmissions?

-A check sum that permits error detection

-A header that contains the call sign of the station to which the information is being sent

-Automatic repeat request in case of error

**All of these choices are correct**

What code is used when sending CW in the amateur bands?

**International Morse**

Which of the following operating activities is supported by digital mode software in the WSJT suite?

-Moonbounce or Earth-Moon-Earth

-Weak-signal propagation beacons

-Meteor scatter

**All of these choices are correct**

What is an ARQ transmission system?

**A digital scheme whereby the receiving station detects errors and sends a request to the sending station to retransmit the information**

Which of the following best describes Broadband-Hamnet(TM), also referred to as a high-speed multi-media network?

**An amateur-radio-based data network using commercial Wi-Fi gear with modified firmware**

What is FT8?

**A digital mode capable of operating in low signal-to-noise conditions that transmits on 15-second intervals**

What is an electronic keyer?

**A device that assists in manual sending of Morse code**

## **SUBELEMENT T9 – Antennas and feed lines - [2 Exam Questions - 2 Groups]**

What is a beam antenna?

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

Which of the following describes a type of antenna loading?

**Inserting an inductor in the radiating portion of the antenna to make it electrically longer**

Which of the following describes a simple dipole oriented parallel to the Earth's surface?

**A horizontally polarized antenna**

What is a disadvantage of the "rubber duck" antenna supplied with most handheld radio transceivers when compared to a full-sized quarter-wave antenna?

**It does not transmit or receive as effectively**

How would you change a dipole antenna to make it resonant on a higher frequency?  
**Shorten it**

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

What is a disadvantage of using a handheld VHF transceiver, with its integral antenna, inside a vehicle?  
**Signals might not propagate well due to the shielding effect of the vehicle**

What is the approximate length, in inches, of a quarter-wavelength vertical antenna for 146 MHz?  
**19**

What is the approximate length, in inches, of a half-wavelength 6 meter dipole antenna?  
**112**

In which direction does a half-wave dipole antenna radiate the strongest signal?  
**Broadside to the antenna**

What is the gain of an antenna?  
**The increase in signal strength in a specified direction compared to a reference antenna**

What is an advantage of using a properly mounted 5/8 wavelength antenna for VHF or UHF mobile service?  
**It has a lower radiation angle and more gain than a 1/4 wavelength antenna**

Why is it important to have low SWR when using coaxial cable feed line?  
**To reduce signal loss**

What is the impedance of most coaxial cables used in amateur radio installations?  
**50 ohms**

Why is coaxial cable the most common feed line selected for amateur radio antenna systems?  
**It is easy to use and requires few special installation considerations**

What is the major function of an antenna tuner (antenna coupler)?  
**It matches the antenna system impedance to the transceiver's output impedance**

In general, what happens as the frequency of a signal passing through coaxial cable is increased?  
**The loss increases**

Which of the following connectors is most suitable for frequencies above 400 MHz?  
**A Type N connector**

Which of the following is true of PL-259 type coax connectors?  
**They are commonly used at HF frequencies**

Why should coax connectors exposed to the weather be sealed against water intrusion?  
**To prevent an increase in feed line loss**

What can cause erratic changes in SWR readings?

**A loose connection in an antenna or a feed line**

What is the electrical difference between RG-58 and RG-8 coaxial cable?

**RG-8 cable has less loss at a given frequency**

Which of the following types of feed line has the lowest loss at VHF and UHF?

**Air-insulated hard line**

**SUBELEMENT T0 – Electrical safety: AC and DC power circuits; antenna installation; RF hazards – [3 Exam Questions - 3 Groups]**

Which of the following is a safety hazard of a 12-volt storage battery?

**Shorting the terminals can cause burns, fire, or an explosion**

What health hazard is presented by electrical current flowing through the body?

- It may cause injury by heating tissue
- It may disrupt the electrical functions of cells
- It may cause involuntary muscle contractions

**All of these choices are correct**

In the United States, what is connected to the green wire in a three-wire electrical AC plug?

**Equipment ground**

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

**To interrupt power in case of overload**

Why is it unwise to install a 20-ampere fuse in the place of a 5-ampere fuse?

**Excessive current could cause a fire**

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

- Use three-wire cords and plugs for all AC powered equipment
- Connect all AC powered station equipment to a common safety ground
- Use a circuit protected by a ground-fault interrupter

**All of these choices are correct**

Which of these precautions should be taken when installing devices for lightning protection in a coaxial cable feed line?

**Mount all of the protectors on a metal plate that is in turn connected to an external ground rod**

What safety equipment should always be included in home-built equipment that is powered from 120V AC power circuits?

**A fuse or circuit breaker in series with the AC hot conductor**

What should be done to all external ground rods or earth connections?

**Bond them together with heavy wire or conductive strap**

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

**The battery could overheat, give off flammable gas, or explode**

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

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

When should members of a tower work team wear a hard hat and safety glasses?

**At all times when any work is being done on the tower**

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

**Put on a carefully inspected climbing harness (fall arrester) and safety glasses**

Under what circumstances is it safe to climb a tower without a helper or observer?

**Never**

Which of the following is an important safety precaution to observe when putting up an antenna tower?

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

What is the purpose of a gin pole?

**To lift tower sections or antennas**

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

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

Which of the following is an important safety rule to remember when using a crank-up tower?

**This type of tower must not be climbed unless retracted or mechanical safety locking devices have been installed**

What is considered to be a proper grounding method for a tower?

**Separate eight-foot long ground rods for each tower leg, bonded to the tower and each other**

Why should you avoid attaching an antenna to a utility pole?

**The antenna could contact high-voltage power lines**

Which of the following is true when installing grounding conductors used for lightning protection?

**Sharp bends must be avoided**

Which of the following establishes grounding requirements for an amateur radio tower or antenna?

**Local electrical codes**

Which of the following is good practice when installing ground wires on a tower for lightning protection?

**Ensure that connections are short and direct**

What is the purpose of a safety wire through a turnbuckle used to tension guy lines?

**Prevent loosening of the guy line from vibration**

What type of radiation are VHF and UHF radio signals?

**Non-ionizing radiation**

Which of the following frequencies has the lowest value for Maximum Permissible Exposure limit?

**50 MHz**

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

**50 watts PEP at the antenna**

What factors affect the RF exposure of people near an amateur station antenna?

-Frequency and power level of the RF field

-Distance from the antenna to a person

-Radiation pattern of the antenna

**All of these choices are correct**

Why do exposure limits vary with frequency?

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

Which of the following is an acceptable method to determine that your station complies with FCC RF exposure regulations?

-By calculation based on FCC OET Bulletin 65

-By calculation based on computer modeling

-By measurement of field strength using calibrated equipment

**All of these choices are correct**

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

**They might receive a painful RF burn**

Which of the following actions might amateur operators take to prevent exposure to RF radiation in excess of FCC-supplied limits?

**Relocate antennas**

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

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

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

**It affects the average exposure of people to radiation**

What is the definition of duty cycle during the averaging time for RF exposure?

**The percentage of time that a transmitter is transmitting**

How does RF radiation differ from ionizing radiation (radioactivity)?

**RF radiation does not have sufficient energy to cause genetic damage**

If the averaging time for exposure is 6 minutes, how much power density is permitted if the signal is present for 3 minutes and absent for 3 minutes rather than being present for the entire 6 minutes??

**2 times as much**

The End!