

Chapter 11

Question Pool

Technician Class Syllabus

Effective July 1, 2018 to June 30, 2022

SUBELEMENT T1 — FCC Rules, descriptions, and definitions for the Amateur Radio Service, operator and station license responsibilities

[6 Exam Questions — 6 Groups]

- T1A Amateur Radio Service: purpose and permissible use of the Amateur Radio Service, operator/primary station license grant; Meanings of basic terms used in FCC rules; Interference; RACES rules; Phonetics; Frequency Coordinator
- T1B Authorized frequencies: frequency allocations; ITU; emission modes; restricted sub-bands; spectrum sharing; transmissions near band edges; contacting the International Space Station; power output
- T1C Operator licensing: operator classes; sequential and vanity call sign systems; international communications; reciprocal operation; places where the Amateur Radio Service is regulated by the FCC; name and address on FCC license database; license term; renewal; grace period
- T1D Authorized and prohibited transmission: communications with other countries; music; exchange of information with other services; indecent language; compensation for use of station; retransmission of other amateur signals; codes and ciphers; sale of equipment; unidentified transmissions; one-way transmission
- T1E Control operator and control types: control operator required; eligibility; designation of control operator; privileges and duties; control point; local, automatic and remote control; location of control operator
- T1F Station identification; repeaters; third-party communications; club stations; FCC inspection

SUBELEMENT T2 — Operating Procedures

[3 Exam Questions — 3 Groups]

- T2A Station operation: choosing an operating frequency; calling another station; test transmissions; procedural signs; use of minimum power; choosing an operating frequency; band plans; calling frequencies; repeater offsets
- T2B VHF/UHF operating practices: SSB phone; FM repeater; simplex; splits and shifts; CTCSS; DTMF; tone squelch; carrier squelch; phonetics; operational problem resolution; Q signals
- T2C Public service: emergency and non-emergency operations; applicability of FCC rules; RACES and ARES; net and traffic procedures; operating restrictions during emergencies

SUBELEMENT T3 — Radio wave characteristics: properties of radio waves; propagation modes

[3 Exam Questions — 3 Groups]

- T3A Radio wave characteristics: how a radio signal travels; fading; multipath; polarization; wavelength vs absorption; antenna orientation
- T3B Radio and electromagnetic wave properties: the electromagnetic spectrum; wavelength vs frequency; nature and velocity of electromagnetic waves; definition of UHF, VHF, HF bands; calculating wavelength
- T3C Propagation modes: line of sight; sporadic E; meteor and auroral scatter and reflections; tropospheric ducting; F layer skip; radio horizon

SUBELEMENT T4 — Amateur radio practices and station set-up

[2 Exam Questions — 2 Groups]

- T4A Station setup: connecting microphones; reducing unwanted emissions; power source; connecting a computer; RF grounding; connecting digital equipment; connecting an SWR meter
- T4B Operating controls: tuning; use of filters; squelch function; AGC; transceiver operation; memory channels

SUBELEMENT T5 — Electrical principles: math for electronics; electronic principles; Ohm's Law

[4 Exam Questions — 4 Groups]

- T5A Electrical principles, units, and terms: current and voltage; conductors and insulators; alternating and direct current; series and parallel circuits
- T5B Math for electronics: conversion of electrical units; decibels; the metric system
- T5C Electronic principles: capacitance; inductance; current flow in circuits; alternating current; definition of RF; definition of polarity; DC power calculations; impedance
- T5D Ohm's Law: formulas and usage; components in series and parallel

SUBELEMENT T6 — Electrical components; circuit diagrams; component functions

[4 Exam Questions — 4 Groups]

- T6A Electrical components: fixed and variable resistors; capacitors and inductors; fuses; switches; batteries
- T6B Semiconductors: basic principles and applications of solid state devices; diodes and transistors
- T6C Circuit diagrams; schematic symbols
- T6D Component functions: rectification; switches; indicators; power supply components; resonant circuit; shielding; power transformers; integrated circuits

SUBELEMENT T7 — Station equipment: common transmitter and receiver problems; antenna measurements; troubleshooting; basic repair and testing

[4 Exam Questions — 4 Groups]

- T7A Station equipment: receivers; transmitters; transceivers; modulation; transverters; transmit and receive amplifiers
- T7B Common transmitter and receiver problems: symptoms of overload and overdrive; distortion; causes of interference; interference and consumer electronics; part 15 devices; over-modulation; RF feedback; off frequency signals
- T7C Antenna measurements and troubleshooting: measuring SWR; dummy loads; coaxial cables; causes of feed line failures
- T7D Basic repair and testing: soldering; using basic test instruments; connecting a voltmeter, ammeter, or ohmmeter

SUBELEMENT T8 — Modulation modes: amateur satellite operation; operating activities; non-voice and digital communications

[4 Exam Questions — 4 Groups]

- T8A Modulation modes: bandwidth of various signals; choice of emission type
- T8B Amateur satellite operation; Doppler shift; basic orbits; operating protocols; transmitter power considerations; telemetry and telecommand; satellite tracking
- T8C Operating activities: radio direction finding; radio control; contests; linking over the internet; grid locators
- T8D Non-voice and digital communications: image signals; digital modes; CW; packet radio; PSK31; APRS; error detection and correction; NTSC; amateur radio networking; Digital Mobile/Migration Radio

SUBELEMENT T9 — Antennas and feed lines

[2 Exam Questions — 2 Groups]

- T9A Antennas: vertical and horizontal polarization; concept of gain; common portable and mobile antennas; relationships between resonant length and frequency; concept of dipole antennas
- T9B Feed lines: types, attenuation vs frequency, selecting; SWR concepts; Antenna tuners (couplers); RF Connectors: selecting, weather protection

SUBELEMENT T10 — Electrical safety: AC and DC power circuits; antenna installation; RF hazards

[3 Exam Questions — 3 Groups]

- T10A Power circuits and hazards: hazardous voltages; fuses and circuit breakers; grounding; lightning protection; battery safety; electrical code compliance
- T10B Antenna safety: tower safety and grounding; erecting an antenna support; safely installing an antenna
- T10C RF hazards: radiation exposure; proximity to antennas; recognized safe power levels; exposure to others; radiation types; duty cycle

Technician Class Question Pool

Effective for VEC examinations on July 1, 2018 through June 30, 2022

SUBELEMENT T1

FCC Rules, descriptions, and definitions for the Amateur Radio Service, operator and station license responsibilities [6 Exam Questions — 6 Groups]

T1A — Amateur Radio Service: purpose and permissible use of the Amateur Radio Service, operator/primary station license grant; Meanings of basic terms used in FCC rules; Interference; RACES rules; Phonetics; Frequency Coordinator

T1A01

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

- A. Providing personal radio communications for as many citizens as possible
- B. Providing communications for international non-profit organizations
- C. Advancing skills in the technical and communication phases of the radio art
- D. All of these choices are correct

T1A01

(C)

[97.1]

Page 7-2

T1A02

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

- A. FEMA
- B. Homeland Security
- C. The FCC
- D. All of these choices are correct

T1A02

(C)

[97.1]

Page 7-2

T1A03

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

- A. It is required when transmitting emergency messages
- B. It is prohibited
- C. It is required when in contact with foreign stations
- D. It is encouraged

T1A03

(D)

[97.119(b)(2)]

Page 8-4

T1A04

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

- A. One
- B. No more than two
- C. One for each band on which the person plans to operate
- D. One for each permanent station location from which the person plans to operate

T1A04

(A)

[97.5(b)(1)]

Page 7-3

T1A05
(C)
[97.7]
Page 7-5

T1A05
What is proof of possession of an FCC-issued operator/primary license grant?
A. A printed operator/primary station license issued by the FCC must be displayed at the transmitter site
B. The control operator must have an operator/primary station license in his or her possession when in control of a transmitter
C. The control operator's operator/primary station license must appear in the FCC ULS consolidated licensee database
D. All of these choices are correct

T1A06
(C)
[97.3(a)(9)]
Page 7-12

T1A06
What is the FCC Part 97 definition of a beacon?
A. A government transmitter marking the amateur radio band edges
B. A bulletin sent by the FCC to announce a national emergency
C. An amateur station transmitting communications for the purposes of observing propagation or related experimental activities
D. A continuous transmission of weather information authorized in the amateur bands by the National Weather Service

T1A07
(C)
[97.3(a)(41)]
Page 6-23

T1A07
What is the FCC Part 97 definition of a space station?
A. Any satellite orbiting the earth
B. A manned satellite orbiting the earth
C. An amateur station located more than 50 km above the Earth's surface
D. An amateur station using amateur radio satellites for relay of signals

T1A08
(B)
[97.3(a)(22)]
Page 7-13

T1A08
Which of the following entities recommends transmit/receive channels and other parameters for auxiliary and repeater stations?
A. Frequency Spectrum Manager appointed by the FCC
B. Volunteer Frequency Coordinator recognized by local amateurs
C. FCC Regional Field Office
D. International Telecommunications Union

T1A09
(C)
[97.3(a)(22)]
Page 7-13

T1A09
Who selects a Frequency Coordinator?
A. The FCC Office of Spectrum Management and Coordination Policy
B. The local chapter of the Office of National Council of Independent Frequency Coordinators
C. Amateur operators in a local or regional area whose stations are eligible to be repeater or auxiliary stations
D. FCC Regional Field Office

T1A10
(D)
[97.3(a)(38),
97.407]
Page 6-18

T1A10
Which of the following describes the Radio Amateur Civil Emergency Service (RACES)?
A. A radio service using amateur frequencies for emergency management or civil defense communications
B. A radio service using amateur stations for emergency management or civil defense communications
C. An emergency service using amateur operators certified by a civil defense organization as being enrolled in that organization
D. All of these choices are correct

T1A11		T1A11
When is willful interference to other amateur radio stations permitted?		(B)
A. To stop another amateur station which is breaking the FCC rules		[97.101
B. At no time		(D)]
C. When making short test transmissions		Page 8-6
D. At any time, stations in the Amateur Radio Service are not protected from willful interference		
T1B — Authorized frequencies; frequency allocations; ITU; emission modes; restricted sub-bands; spectrum sharing; transmissions near band edges; contacting the International Space Station; power output		
T1B01		T1B01
What is the International Telecommunications Union (ITU)?		(B)
A. An agency of the United States Department of Telecommunications Management		Page 7-14
B. A United Nations agency for information and communication technology issues		
C. An independent frequency coordination agency		
D. A department of the FCC		
T1B02		T1B02
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?		(B)
A. Only members of amateur radio clubs at NASA facilities		[97.301,
B. Any amateur holding a Technician or higher-class license		97.207(c)]
C. Only the astronaut's family members who are hams		Page 6-23
D. Contacts with the ISS are not permitted on amateur radio frequencies		
T1B03		T1B03
Which frequency is within the 6 meter amateur band?		(B)
A. 49.00 MHz		[97.301(a)]
B. 52.525 MHz		Page 7-9
C. 28.50 MHz		
D. 222.15 MHz		
T1B04		T1B04
Which amateur band are you using when your station is transmitting on 146.52 MHz?		(A)
A. 2 meter band		[97.301(a)]
B. 20 meter band		Page 7-9
C. 14 meter band		
D. 6 meter band		
T1B05		T1B05
What is the limitation for emissions on the frequencies between 219 and 220 MHz?		(B)
A. Spread spectrum only		[97.305(c)]
B. Fixed digital message forwarding systems only		Page 7-12
C. Emergency traffic only		
D. Fast-scan television only		
T1B06		T1B06
On which HF bands does a Technician class operator have phone privileges?		(B)
A. None		[97.301(e),
B. 10 meter band only		97.305]
C. 80 meter, 40 meter, 15 meter and 10 meter bands		Page 7-11
D. 30 meter band only		

T1B07 (A) [97.305(a), (c)] Page 7-12	T1B07 Which of the following VHF/UHF frequency ranges are limited to CW only? A. 50.0 MHz to 50.1 MHz and 144.0 MHz to 144.1 MHz B. 219 MHz to 220 MHz and 420.0 MHz to 420.1 MHz C. 902.0 MHz to 902.1 MHz D. All of these choices are correct
T1B08 (A) [97.303] Page 7-13	T1B08 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)? A. U.S. amateurs may find non-amateur stations in those portions, and must avoid interfering with them B. U.S. amateurs must give foreign amateur stations priority in those portions C. International communications are not permitted in those portions D. Digital transmissions are not permitted in those portions
T1B09 (D) [97.101(a), 97.301(a-e)] Page 5-7	T1B09 Why should you not set your transmit frequency to be exactly at the edge of an amateur band or sub-band? A. To allow for calibration error in the transmitter frequency display B. So that modulation sidebands do not extend beyond the band edge C. To allow for transmitter frequency drift D. All of these choices are correct
T1B10 (D) [97.301(e), 97.305(c)] Page 7-11	T1B10 Which of the following HF bands have frequencies available to the Technician class operator for RTTY and data transmissions? A. 10 meter, 12 meter, 17 meter, and 40 meter bands B. 10 meter, 15 meter, 40 meter, and 80 meter bands C. 30 meter band only D. 10 meter band only
T1B11 (A) [97.313] Page 7-12	T1B11 What is the maximum peak envelope power output for Technician class operators using their assigned portions of the HF bands? A. 200 watts B. 100 watts C. 50 watts D. 10 watts
T1B12 (D) [97.313(b)] Page 7-12	T1B12 Except for some specific restrictions, what is the maximum peak envelope power output for Technician class operators using frequencies above 30 MHz? A. 50 watts B. 100 watts C. 500 watts D. 1500 watts

T1C — Operator licensing; operator classes; sequential and vanity call sign systems; international communications; reciprocal operation; places where the Amateur Radio Service is regulated by the FCC; name and address on FCC license database; license term; renewal; grace period

T1C01

For which license classes are new licenses currently available from the FCC?

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

T1C01

(D)
[97.9(a),
97.17(a)]
Page 7-3

T1C02

Who may select a desired call sign under the vanity call sign rules?

- A. Only a licensed amateur with a General or Amateur Extra class license
- B. Only a licensed amateur with an Amateur Extra class license
- C. Only a licensed amateur who has been licensed continuously for more than 10 years
- D. Any licensed amateur

T1C02

(D)
[97.19]
Page 7-17

T1C03

What types of international communications is an FCC-licensed amateur radio station permitted to make?

- A. Communications incidental to the purposes of the Amateur Radio Service and remarks of a personal character
- B. Communications incidental to conducting business or remarks of a personal nature
- C. Only communications incidental to contest exchanges, all other communications are prohibited
- D. Any communications that would be permitted by an international broadcast station

T1C03

(A)
[97.117]
Page 7-15

T1C04

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

- A. When the foreign country authorizes it
- B. When there is a mutual agreement allowing third party communications
- C. When authorization permits amateur communications in a foreign language
- D. When you are communicating with non-licensed individuals in another country

T1C04

(A)
[97.107]
Page 7-15

T1C05

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

- A. K1XXX
- B. KA1X
- C. W1XX
- D. All of these choices are correct

T1C05

(A)
Page 7-17

T1C06

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

- A. From within any country that belongs to the International Telecommunications Union
- B. From within any country that is a member of the United Nations
- C. From anywhere within International Telecommunications Union (ITU) Regions 2 and 3
- D. From any vessel or craft located in international waters and documented or registered in the United States

T1C06

(D)
[97.5(a)(2)]
Page 7-15

T1C07 (B) [97.23] Page 7-8	<p>T1C07</p> <p>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?</p> <ul style="list-style-type: none"> A. Fine or imprisonment B. Revocation of the station license or suspension of the operator license C. Require the licensee to be re-examined D. A reduction of one rank in operator class
T1C08 (C) [97.25] Page 7-5	<p>T1C08</p> <p>What is the normal term for an FCC-issued primary station/operator amateur radio license grant?</p> <ul style="list-style-type: none"> A. Five years B. Life C. Ten years D. Twenty years
T1C09 (A) [97.21(a)(b)] Page 7-5	<p>T1C09</p> <p>What is the grace period following the expiration of an amateur license within which the license may be renewed?</p> <ul style="list-style-type: none"> A. Two years B. Three years C. Five years D. Ten years
T1C10 (C) [97.5a] Page 7-5	<p>T1C10</p> <p>How soon after passing the examination for your first amateur radio license may you operate a transmitter on an Amateur Radio Service frequency?</p> <ul style="list-style-type: none"> A. Immediately B. 30 days after the test date C. As soon as your operator/station license grant appears in the FCC's license database D. You must wait until you receive your license in the mail from the FCC
T1C11 (A) [97.21(b)] Page 7-5	<p>T1C11</p> <p>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?</p> <ul style="list-style-type: none"> A. No, transmitting is not allowed until the FCC license database shows that the license has been renewed B. Yes, but only if you identify using the suffix GP C. Yes, but only during authorized nets D. Yes, for up to two years
	<p>T1D — Authorized and prohibited transmission: communications with other countries; music; exchange of information with other services; indecent language; compensation for use of station; retransmission of other amateur signals; codes and ciphers; sale of equipment; unidentified transmissions; one-way transmission</p>
T1D01 (A) [97.111(a)(1)] Page 7-15	<p>T1D01</p> <p>With which countries are FCC-licensed amateur radio stations prohibited from exchanging communications?</p> <ul style="list-style-type: none"> A. Any country whose administration has notified the International Telecommunications Union (ITU) that it objects to such communications B. Any country whose administration has notified the American Radio Relay League (ARRL) that it objects to such communications C. Any country engaged in hostilities with another country D. Any country in violation of the War Powers Act of 1934

<p>T1D02</p> <p>Under which of the following circumstances may an amateur radio station make one-way transmissions?</p> <ul style="list-style-type: none"> A. Under no circumstances B. When transmitting code practice, information bulletins, or transmissions necessary to provide emergency communications C. At any time, as long as no music is transmitted D. At any time, as long as the material being transmitted did not originate from a commercial broadcast station 	<p>T1D02</p> <p>(B)</p> <p>[97.113(b), 97.111(b)]</p> <p>Page 8-12</p>
<p>T1D03</p> <p>When is it permissible to transmit messages encoded to hide their meaning?</p> <ul style="list-style-type: none"> A. Only during contests B. Only when operating mobile C. Only when transmitting control commands to space stations or radio control craft D. Only when frequencies above 1280 MHz are used 	<p>T1D03</p> <p>(C)</p> <p>[97.211(b), 97.215(b), 97.114(a)(4)]</p> <p>Page 8-11</p>
<p>T1D04</p> <p>Under what conditions is an amateur station authorized to transmit music using a phone emission?</p> <ul style="list-style-type: none"> A. When incidental to an authorized retransmission of manned spacecraft communications B. When the music produces no spurious emissions C. When the purpose is to interfere with an illegal transmission D. When the music is transmitted above 1280 MHz 	<p>T1D04</p> <p>(A)</p> <p>[97.113(a)(4), 97.113(c)]</p> <p>Page 8-12</p>
<p>T1D05</p> <p>When may amateur radio operators use their stations to notify other amateurs of the availability of equipment for sale or trade?</p> <ul style="list-style-type: none"> A. When the equipment is normally used in an amateur station and such activity is not conducted on a regular basis B. When the asking price is \$100.00 or less C. When the asking price is less than its appraised value D. When the equipment is not the personal property of either the station licensee or the control operator or their close relatives 	<p>T1D05</p> <p>(A)</p> <p>[97.113(a)(3)(ii)]</p> <p>Page 8-10</p>
<p>T1D06</p> <p>What, if any, are the restrictions concerning transmission of language that may be considered indecent or obscene?</p> <ul style="list-style-type: none"> A. The FCC maintains a list of words that are not permitted to be used on amateur frequencies B. Any such language is prohibited C. The ITU maintains a list of words that are not permitted to be used on amateur frequencies D. There is no such prohibition 	<p>T1D06</p> <p>(B)</p> <p>[97.113(a)(4)]</p> <p>Page 8-10</p>
<p>T1D07</p> <p>What types of amateur stations can automatically retransmit the signals of other amateur stations?</p> <ul style="list-style-type: none"> A. Auxiliary, beacon, or Earth stations B. Repeater, auxiliary, or space stations C. Beacon, repeater, or space stations D. Earth, repeater, or space stations 	<p>T1D07</p> <p>(B)</p> <p>[97.113(d)]</p> <p>Page 8-12</p>

T1D08 (B) [97.113(a)(3)(iii)] Page 8-11	<p>T1D08</p> <p>In which of the following circumstances may the control operator of an amateur station receive compensation for operating that station?</p> <ul style="list-style-type: none"> A. When the communication is related to the sale of amateur equipment by the control operator's employer B. When the communication is incidental to classroom instruction at an educational institution C. When the communication is made to obtain emergency information for a local broadcast station D. All of these choices are correct
T1D09 (A) [97.113(5)(b)] Page 8-12	<p>T1D09</p> <p>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?</p> <ul style="list-style-type: none"> A. Only where such communications directly relate to the immediate safety of human life or protection of property B. Only when broadcasting communications to or from the space shuttle C. Only where noncommercial programming is gathered and supplied exclusively to the National Public Radio network D. Only when using amateur repeaters linked to the internet
T1D10 (D) [97.3(a)(10)] Page 8-12	<p>T1D10</p> <p>What is the meaning of the term broadcasting in the FCC rules for the Amateur Radio Service?</p> <ul style="list-style-type: none"> A. Two-way transmissions by amateur stations B. Transmission of music C. Transmission of messages directed only to amateur operators D. Transmissions intended for reception by the general public
T1D11 (D) [97.119(a)] Page 8-3	<p>T1D11</p> <p>When may an amateur station transmit without on-the-air identification?</p> <ul style="list-style-type: none"> A. When the transmissions are of a brief nature to make station adjustments B. When the transmissions are unmodulated C. When the transmitted power level is below 1 watt D. When transmitting signals to control model craft
	<p>T1E — Control operator and control types: control operator required; eligibility; designation of control operator; privileges and duties; control point; local, automatic and remote control; location of control operator</p>
T1E01 (D) [97.7(a)] Page 8-1	<p>T1E01</p> <p>When is an amateur station permitted to transmit without a control operator?</p> <ul style="list-style-type: none"> A. When using automatic control, such as in the case of a repeater B. When the station licensee is away and another licensed amateur is using the station C. When the transmitting station is an auxiliary station D. Never
T1E02 (D) [97.301, 97.207(c)] Page 6-22	<p>T1E02</p> <p>Who may be the control operator of a station communicating through an amateur satellite or space station?</p> <ul style="list-style-type: none"> A. Only an Amateur Extra Class operator B. A General class or higher licensee who has a satellite operator certification C. Only an Amateur Extra Class operator who is also an AMSAT member D. Any amateur whose license privileges allow them to transmit on the satellite uplink frequency

T1E03		T1E03
Who must designate the station control operator?		(A)
A. The station licensee		[97.103(b)]
B. The FCC		Page 8-1
C. The frequency coordinator		
D. The ITU		
T1E04		T1E04
What determines the transmitting privileges of an amateur station?		(D)
A. The frequency authorized by the frequency coordinator		[97.103(b)]
B. The frequencies printed on the license grant		Page 8-2
C. The highest class of operator license held by anyone on the premises		
D. The class of operator license held by the control operator		
T1E05		T1E05
What is an amateur station control point?		(C)
A. The location of the station's transmitting antenna		[97.3(a)(14)]
B. The location of the station transmitting apparatus		Page 8-1
C. The location at which the control operator function is performed		
D. The mailing address of the station licensee		
T1E06		T1E06
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?		(A)
A. At no time		[97.301]
B. When operating a special event station		Page 8-2
C. As part of a multi-operator contest team		
D. When using a club station whose trustee is an Amateur Extra class operator licensee		
T1E07		T1E07
When the control operator is not the station licensee, who is responsible for the proper operation of the station?		(D)
A. All licensed amateurs who are present at the operation		[97.103(a)]
B. Only the station licensee		Page 8-2
C. Only the control operator		
D. The control operator and the station licensee are equally responsible		
T1E08		T1E08
Which of the following is an example of automatic control?		(A)
A. Repeater operation		[97.3(a)(6),
B. Controlling the station over the internet		97.205(d)]
C. Using a computer or other device to send CW automatically		Page 8-9
D. Using a computer or other device to identify automatically		
T1E09		T1E09
Which of the following is true of remote control operation?		(D)
A. The control operator must be at the control point		[97.109(c)]
B. A control operator is required at all times		Page 8-9
C. The control operator indirectly manipulates the controls		
D. All of these choices are correct		

T1E10
(B)
[97.3(a)(39)]
Page 8-9

T1E10
Which of the following is an example of remote control as defined in Part 97?
A. Repeater operation
B. Operating the station over the internet
C. Controlling a model aircraft, boat, or car by amateur radio
D. All of these choices are correct

T1E11
(D)
[97.103(a)]
Page 8-2

T1E11
Who does the FCC presume to be the control operator of an amateur station, unless documentation to the contrary is in the station records?
A. The station custodian
B. The third-party participant
C. The person operating the station equipment
D. The station licensee

T1F — Station identification; repeaters; third-party communications; club stations; FCC inspection

T1F01
(B)
[97.103(c)]
Page 7-8

T1F01
When must the station licensee make the station and its records available for FCC inspection?
A. At any time ten days after notification by the FCC of such an inspection
B. At any time upon request by an FCC representative
C. Only after failing to comply with an FCC notice of violation
D. Only when presented with a valid warrant by an FCC official or government agent

T1F02
(C)
[97.119(a)]
Page 8-4

T1F02
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?
A. Never, the tactical call is sufficient
B. Once during every hour
C. At the end of each communication and every ten minutes during a communication
D. At the end of every transmission

T1F03
(D)
[97.119(a)]
Page 8-3

T1F03
When is an amateur station required to transmit its assigned call sign?
A. At the beginning of each contact, and every 10 minutes thereafter
B. At least once during each transmission
C. At least every 15 minutes during and at the end of a communication
D. At least every 10 minutes during and at the end of a communication

T1F04
(C)
[97.119(b)(2)]
Page 8-4

T1F04
Which of the following is an acceptable language to use for station identification when operating in a phone sub-band?
A. Any language recognized by the United Nations
B. Any language recognized by the ITU
C. The English language
D. English, French, or Spanish

T1F05
(B)
[97.119(b)(2)]
Page 8-4

T1F05
What method of call sign identification is required for a station transmitting phone signals?
A. Send the call sign followed by the indicator RPT
B. Send the call sign using a CW or phone emission
C. Send the call sign followed by the indicator R
D. Send the call sign using only a phone emission

T1F06	T1F06
Which of the following formats of a self-assigned indicator is acceptable when identifying using a phone transmission?	(D)
A. KL7CC stroke W3	[97.119(c)]
B. KL7CC slant W3	Page 8-5
C. KL7CC slash W3	
D. All of these choices are correct	
T1F07	T1F07
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?	(B)
A. The person must be a U.S. citizen	[97.115(a)(2)]
B. The foreign station must be one with which the U.S. has a third-party agreement	Page 8-8
C. The licensed control operator must do the station identification	
D. All of these choices are correct	
T1F08	T1F08
What is meant by the term Third Party Communications?	(A)
A. A message from a control operator to another amateur station control operator on behalf of another person	[97.3(a)(47)]
B. Amateur radio communications where three stations are in communications with one another	Page 8-7
C. Operation when the transmitting equipment is licensed to a person other than the control operator	
D. Temporary authorization for an unlicensed person to transmit on the amateur bands for technical experiments	
T1F09	T1F09
What type of amateur station simultaneously retransmits the signal of another amateur station on a different channel or channels?	(C)
A. Beacon station	[97.3(a)(40)]
B. Earth station	Page 2-8
C. Repeater station	
D. Message forwarding station	
T1F10	T1F10
Who is accountable should a repeater inadvertently retransmit communications that violate the FCC rules?	(A)
A. The control operator of the originating station	[97.205(g)]
B. The control operator of the repeater	Page 8-9
C. The owner of the repeater	
D. Both the originating station and the repeater owner	
T1F11	T1F11
Which of the following is a requirement for the issuance of a club station license grant?	(B)
A. The trustee must have an Amateur Extra class operator license grant	[97.5(b)(2)]
B. The club must have at least four members	Page 7-3
C. The club must be registered with the American Radio Relay League	
D. All of these choices are correct	

SUBELEMENT T2

Operating Procedures

[3 Exam Questions — 3 Groups]

T2A — Station operation: choosing an operating frequency; calling another station; test transmissions; procedural signs; use of minimum power; choosing an operating frequency; band plans; calling frequencies; repeater offsets

T2A01
(B)
Page 6-12

T2A01
Which of the following is a common repeater frequency offset in the 2 meter band?

- A. Plus or minus 5 MHz
- B. Plus or minus 600 kHz
- C. Plus or minus 500 kHz
- D. Plus or minus 1 MHz

T2A02
(A)
Page 6-6

T2A02
What is the national calling frequency for FM simplex operations in the 2 meter band?

- A. 146.520 MHz
- B. 145.000 MHz
- C. 432.100 MHz
- D. 446.000 MHz

T2A03
(A)
Page 6-12

T2A03
What is a common repeater frequency offset in the 70 cm band?

- A. Plus or minus 5 MHz
- B. Plus or minus 600 kHz
- C. Plus or minus 500 kHz
- D. Plus or minus 1 MHz

T2A04
(B)
Page 6-4

T2A04
What is an appropriate way to call another station on a repeater if you know the other station's call sign?

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

T2A05
(C)
Page 6-7

T2A05
How should you respond to a station calling CQ?

- A. Transmit "CQ" followed by the other station's call sign
- B. Transmit your call sign followed by the other station's call sign
- C. Transmit the other station's call sign followed by your call sign
- D. Transmit a signal report followed by your call sign

T2A06
(A)
Page 8-5

T2A06
Which of the following is required when making on-the-air test transmissions?

- A. Identify the transmitting station
- B. Conduct tests only between 10 p.m. and 6 a.m. local time
- C. Notify the FCC of the transmissions
- D. All of these choices are correct

T2A07		T2A07
What is meant by “repeater offset?”		(A)
<ul style="list-style-type: none"> A. The difference between a repeater’s transmit frequency and its receive frequency B. The repeater has a time delay to prevent interference C. The repeater station identification is done on a separate frequency D. The number of simultaneous transmit frequencies used by a repeater 		Page 6-12
T2A08		T2A08
What is the meaning of the procedural signal “CQ”?		(D)
<ul style="list-style-type: none"> A. Call on the quarter hour B. A new antenna is being tested (no station should answer) C. Only the called station should transmit D. Calling any station 		Page 6-6
T2A09		T2A09
What brief statement indicates that you are listening on a repeater and looking for a contact?		(B)
<ul style="list-style-type: none"> A. The words “Hello test” followed by your call sign B. Your call sign C. The repeater call sign followed by your call sign D. The letters “QSY” followed by your call sign 		Page 6-4
T2A10		T2A10
What is a band plan, beyond the privileges established by the FCC?		(A)
<ul style="list-style-type: none"> A. A voluntary guideline for using different modes or activities within an amateur band B. A mandated list of operating schedules C. A list of scheduled net frequencies D. A plan devised by a club to indicate frequency band usage 		Page 6-2
T2A11		T2A11
What term describes an amateur station that is transmitting and receiving on the same frequency?		(C)
<ul style="list-style-type: none"> A. Full duplex B. Diplex C. Simplex D. Multiplex 		Page 6-2
T2A12		T2A12
Which of the following is a guideline when choosing an operating frequency for calling CQ?		(D)
<ul style="list-style-type: none"> A. Listen first to be sure that no one else is using the frequency B. Ask if the frequency is in use C. Make sure you are in your assigned band D. All of these choices are correct 		Page 6-7
T2B — VHF/UHF operating practices: SSB phone; FM repeater; simplex; splits and shifts; CTCSS; DTMF; tone squelch; carrier squelch; phonetics; operational problem resolution; Q signals		
T2B01		T2B01
What is the most common use of the “reverse split” function of a VHF/UHF transceiver?		(C)
<ul style="list-style-type: none"> A. Reduce power output B. Increase power output C. Listen on a repeater’s input frequency D. Listen on a repeater’s output frequency 		Page 6-6

T2B02 (D) Page 6-13	<p>T2B02</p> <p>What term describes the use of a sub-audible tone transmitted along with normal voice audio to open the squelch of a receiver?</p> <ul style="list-style-type: none"> A. Carrier squelch B. Tone burst C. DTMF D. CTCSS
T2B03 (B) Page 6-6	<p>T2B03</p> <p>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?</p> <ul style="list-style-type: none"> A. Open the squelch on your radio B. Listen on the repeater input frequency C. Listen on the repeater output frequency D. Increase your transmit power
T2B04 (D) Page 6-13	<p>T2B04</p> <p>Which of the following could be the reason you are unable to access a repeater whose output you can hear?</p> <ul style="list-style-type: none"> A. Improper transceiver offset B. The repeater may require a proper CTCSS tone from your transceiver C. The repeater may require a proper DCS tone from your transceiver D. All of these choices are correct
T2B05 (C) Page 5-8	<p>T2B05</p> <p>What might be the problem if a repeater user says your transmissions are breaking up on voice peaks?</p> <ul style="list-style-type: none"> A. You have the incorrect offset B. You need to talk louder C. You are talking too loudly D. Your transmit power is too high
T2B06 (A) Page 6-15	<p>T2B06</p> <p>What type of tones are used to control repeaters linked by the Internet Relay Linking Project (IRLP) protocol?</p> <ul style="list-style-type: none"> A. DTMF B. CTCSS C. EchoLink D. Sub-audible
T2B07 (C) Page 6-15	<p>T2B07</p> <p>How can you join a digital repeater's "talk group"?</p> <ul style="list-style-type: none"> A. Register your radio with the local FCC office B. Join the repeater owner's club C. Program your radio with the group's ID or code D. Sign your call after the courtesy tone

<p>T2B08</p> <p>Which of the following applies when two stations transmitting on the same frequency interfere with each other?</p> <ul style="list-style-type: none"> A. Common courtesy should prevail, but no one has absolute right to an amateur frequency B. Whoever has the strongest signal has priority on the frequency C. Whoever has been on the frequency the longest has priority on the frequency D. The station that has the weakest signal has priority on the frequency 	<p>T2B08 (A) Page 8-6</p>
<p>T2B09</p> <p>What is a “talk group” on a DMR digital repeater?</p> <ul style="list-style-type: none"> A. A group of operators sharing common interests B. A way for groups of users to share a channel at different times without being heard by other users on the channel C. A protocol that increases the signal-to-noise ratio when multiple repeaters are linked together D. A net that meets at a particular time 	<p>T2B09 (B) Page 6-15</p>
<p>T2B10</p> <p>Which Q signal indicates that you are receiving interference from other stations?</p> <ul style="list-style-type: none"> A. QRM B. QRN C. QTH D. QSB 	<p>T2B10 (A) Page 6-7</p>
<p>T2B11</p> <p>Which Q signal indicates that you are changing frequency?</p> <ul style="list-style-type: none"> A. QRU B. QSY C. QSL D. QRZ 	<p>T2B11 (B) Page 6-7</p>
<p>T2B12</p> <p>Why are simplex channels designated in the VHF/UHF band plans?</p> <ul style="list-style-type: none"> A. So that stations within mutual communications range can communicate without tying up a repeater B. For contest operation C. For working DX only D. So that stations with simple transmitters can access the repeater without automated offset 	<p>T2B12 (A) Page 6-6</p>
<p>T2B13</p> <p>Where may SSB phone be used in amateur bands above 50 MHz?</p> <ul style="list-style-type: none"> A. Only in sub-bands allocated to General class or higher licensees B. Only on repeaters C. In at least some portion of all these bands D. On any band as long as power is limited to 25 watts 	<p>T2B13 (C) Page 6-2</p>
<p>T2B14</p> <p>Which of the following describes a linked repeater network?</p> <ul style="list-style-type: none"> A. A network of repeaters where signals received by one repeater are repeated by all the repeaters B. A repeater with more than one receiver C. Multiple repeaters with the same owner D. A system of repeaters linked by APRS 	<p>T2B14 (A) Page 6-12</p>

T2C — Public service: emergency and non-emergency operations; applicability of FCC rules; RACES and ARES; net and traffic procedures; operating restrictions during emergencies

T2C01 (D) [97.103(a)] Page 6-18	T2C01 When do the FCC rules NOT apply to the operation of an amateur station? A. When operating a RACES station B. When operating under special FEMA rules C. When operating under special ARES rules D. Never, FCC rules always apply
T2C02 (B) Page 6-16	T2C02 What is meant by the term “NCS” used in net operation? A. Nominal Control System B. Net Control Station C. National Communications Standard D. Normal Communications Syntax
T2C03 (C) Page 6-17	T2C03 What should be done when using voice modes to ensure that voice messages containing unusual words are received correctly? A. Send the words by voice and Morse code B. Speak very loudly into the microphone C. Spell the words using a standard phonetic alphabet D. All of these choices are correct
T2C04 (D) Page 6-18	T2C04 What do RACES and ARES have in common? A. They represent the two largest ham clubs in the United States B. Both organizations broadcast road and weather information C. Neither may handle emergency traffic supporting public service agencies D. Both organizations may provide communications during emergencies
T2C05 (A) Page 6-15	T2C05 What does the term “traffic” refer to in net operation? A. Formal messages exchanged by net stations B. The number of stations checking in and out of a net C. Operation by mobile or portable stations D. Requests to activate the net by a served agency
T2C06 (C) Page 6-16	T2C06 Which of the following is an accepted practice to get the immediate attention of a net control station when reporting an emergency? A. Repeat “SOS” three times followed by the call sign of the reporting station B. Press the push-to-talk button three times C. Begin your transmission by saying “Priority” or “Emergency” followed by your call sign D. Play a pre-recorded emergency alert tone followed by your call sign

<p>T2C07</p> <p>Which of the following is an accepted practice for an amateur operator who has checked into a net?</p> <ul style="list-style-type: none"> A. Provided that the frequency is quiet, announce the station call sign and location every 5 minutes B. Move 5 kHz away from the net's frequency and use high power to ask other hams to keep clear of the net frequency C. Remain on frequency without transmitting until asked to do so by the net control station D. All of these choices are correct 	<p>T2C07 (C) Page 6-16</p>
<p>T2C08</p> <p>Which of the following is a characteristic of good traffic handling?</p> <ul style="list-style-type: none"> A. Passing messages exactly as received B. Making decisions as to whether messages are worthy of relay or delivery C. Ensuring that any newsworthy messages are relayed to the news media D. All of these choices are correct 	<p>T2C08 (A) Page 6-16</p>
<p>T2C09</p> <p>Are amateur station control operators ever permitted to operate outside the frequency privileges of their license class?</p> <ul style="list-style-type: none"> A. No B. Yes, but only when part of a FEMA emergency plan C. Yes, but only when part of a RACES emergency plan D. Yes, but only if necessary in situations involving the immediate safety of human life or protection of property 	<p>T2C09 (D) Page 6-18</p>
<p>T2C10</p> <p>What information is contained in the preamble of a formal traffic message?</p> <ul style="list-style-type: none"> A. The email address of the originating station B. The address of the intended recipient C. The telephone number of the addressee D. The information needed to track the message 	<p>T2C10 (D) Page 6-17</p>
<p>T2C11</p> <p>What is meant by the term "check," in reference to a formal traffic message?</p> <ul style="list-style-type: none"> A. The number of words or word equivalents in the text portion of the message B. The value of a money order attached to the message C. A list of stations that have relayed the message D. A box on the message form that indicates that the message was received and/or relayed 	<p>T2C11 (A) Page 6-17</p>
<p>T2C12</p> <p>What is the Amateur Radio Emergency Service (ARES)?</p> <ul style="list-style-type: none"> A. Licensed amateurs who have voluntarily registered their qualifications and equipment for communications duty in the public service B. Licensed amateurs who are members of the military and who voluntarily agreed to provide message handling services in the case of an emergency C. A training program that provides licensing courses for those interested in obtaining an amateur license to use during emergencies D. A training program that certifies amateur operators for membership in the Radio Amateur Civil Emergency Service 	<p>T2C12 (A) Page 6-18</p>

SUBELEMENT T3

Radio wave characteristics: properties of radio waves; propagation modes

[3 Exam Questions — 3 Groups]

T3A — Radio wave characteristics: how a radio signal travels; fading; multipath; polarization; wavelength vs absorption; antenna orientation

T3A01
(D)
Page 4-2

T3A01

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?

- A. Change the batteries in your radio to a different type
- B. Turn on the CTCSS tone
- C. Ask the other operator to adjust his squelch control
- D. Try moving a few feet or changing the direction of your antenna if possible, as reflections may be causing multi-path distortion

T3A02
(B)
Page 4-2

T3A02

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

- A. Less ionospheric absorption
- B. Less absorption by vegetation
- C. Less solar activity
- D. Less tropospheric absorption

T3A03
(C)
Page 4-16

T3A03

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

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

T3A04
(B)
Page 4-6

T3A04

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?

- A. The modulation sidebands might become inverted
- B. Signals could be significantly weaker
- C. Signals have an echo effect on voices
- D. Nothing significant will happen

T3A05
(B)
Page 4-16

T3A05

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?

- A. Change from vertical to horizontal polarization
- B. Try to find a path that reflects signals to the repeater
- C. Try the long path
- D. Increase the antenna SWR

T3A06		T3A06
What term is commonly used to describe the rapid fluttering sound sometimes heard from mobile stations that are moving while transmitting?		(B)
A. Flip-flopping		Page 4-3
B. Picket fencing		
C. Frequency shifting		
D. Pulsing		
T3A07		T3A07
What type of wave carries radio signals between transmitting and receiving stations?		(A)
A. Electromagnetic		Page 4-6
B. Electrostatic		
C. Surface acoustic		
D. Ferromagnetic		
T3A08		T3A08
Which of the following is a likely cause of irregular fading of signals received by ionospheric reflection?		(C)
A. Frequency shift due to Faraday rotation		Page 4-2
B. Interference from thunderstorms		
C. Random combining of signals arriving via different paths		
D. Intermodulation distortion		
T3A09		T3A09
Which of the following results from the fact that skip signals refracted from the ionosphere are elliptically polarized?		(B)
A. Digital modes are unusable		Page 4-7
B. Either vertically or horizontally polarized antennas may be used for transmission or reception		
C. FM voice is unusable		
D. Both the transmitting and receiving antennas must be of the same polarization		
T3A10		T3A10
What may occur if data signals arrive via multiple paths?		(D)
A. Transmission rates can be increased by a factor equal to the number of separate paths observed		Page 4-3
B. Transmission rates must be decreased by a factor equal to the number of separate paths observed		
C. No significant changes will occur if the signals are transmitted using FM		
D. Error rates are likely to increase		
T3A11		T3A11
Which part of the atmosphere enables the propagation of radio signals around the world?		(C)
A. The stratosphere		Page 4-3
B. The troposphere		
C. The ionosphere		
D. The magnetosphere		
T3A12		T3A12
How might fog and light rain affect radio range on the 10 meter and 6 meter bands?		(B)
A. Fog and rain absorb these wavelength bands		Page 4-2
B. Fog and light rain will have little effect on these bands		
C. Fog and rain will deflect these signals		
D. Fog and rain will increase radio range		

T3A13 (C) Page 4-2	<p>T3A13</p> <p>What weather condition would decrease range at microwave frequencies?</p> <ul style="list-style-type: none"> A. High winds B. Low barometric pressure C. Precipitation D. Colder temperatures <p>T3B — Radio and electromagnetic wave properties: the electromagnetic spectrum; wavelength vs frequency; nature and velocity of electromagnetic waves; definition of UHF, VHF, HF bands; calculating wavelength</p>
T3B01 (C) Page 2-5	<p>T3B01</p> <p>What is the name for the distance a radio wave travels during one complete cycle?</p> <ul style="list-style-type: none"> A. Wave speed B. Waveform C. Wavelength D. Wave spread
T3B02 (A) Page 4-6	<p>T3B02</p> <p>What property of a radio wave is used to describe its polarization?</p> <ul style="list-style-type: none"> A. The orientation of the electric field B. The orientation of the magnetic field C. The ratio of the energy in the magnetic field to the energy in the electric field D. The ratio of the velocity to the wavelength
T3B03 (C) Page 4-6	<p>T3B03</p> <p>What are the two components of a radio wave?</p> <ul style="list-style-type: none"> A. AC and DC B. Voltage and current C. Electric and magnetic fields D. Ionizing and non-ionizing radiation
T3B04 (A) Page 2-5	<p>T3B04</p> <p>How fast does a radio wave travel through free space?</p> <ul style="list-style-type: none"> A. At the speed of light B. At the speed of sound C. Its speed is inversely proportional to its wavelength D. Its speed increases as the frequency increases
T3B05 (B) Page 2-5	<p>T3B05</p> <p>How does the wavelength of a radio wave relate to its frequency?</p> <ul style="list-style-type: none"> A. The wavelength gets longer as the frequency increases B. The wavelength gets shorter as the frequency increases C. There is no relationship between wavelength and frequency D. The wavelength depends on the bandwidth of the signal
T3B06 (D) Page 2-6	<p>T3B06</p> <p>What is the formula for converting frequency to approximate wavelength in meters?</p> <ul style="list-style-type: none"> A. Wavelength in meters equals frequency in hertz multiplied by 300 B. Wavelength in meters equals frequency in hertz divided by 300 C. Wavelength in meters equals frequency in megahertz divided by 300 D. Wavelength in meters equals 300 divided by frequency in megahertz

T3B07		T3B07
What property of radio waves is often used to identify the different frequency bands?	(A)	Page 2-6
<ul style="list-style-type: none"> A. The approximate wavelength B. The magnetic intensity of waves C. The time it takes for waves to travel one mile D. The voltage standing wave ratio of waves 		
T3B08		T3B08
What are the frequency limits of the VHF spectrum?	(B)	Page 2-4
<ul style="list-style-type: none"> A. 30 to 300 kHz B. 30 to 300 MHz C. 300 to 3000 kHz D. 300 to 3000 MHz 		
T3B09		T3B09
What are the frequency limits of the UHF spectrum?	(D)	Page 2-4
<ul style="list-style-type: none"> A. 30 to 300 kHz B. 30 to 300 MHz C. 300 to 3000 kHz D. 300 to 3000 MHz 		
T3B10		T3B10
What frequency range is referred to as HF?	(C)	Page 2-4
<ul style="list-style-type: none"> A. 300 to 3000 MHz B. 30 to 300 MHz C. 3 to 30 MHz D. 300 to 3000 kHz 		
T3B11		T3B11
What is the approximate velocity of a radio wave as it travels through free space?	(B)	Page 2-5
<ul style="list-style-type: none"> A. 150,000 kilometers per second B. 300,000,000 meters per second C. 300,000,000 miles per hour D. 150,000 miles per hour 		
T3C — Propagation modes: line of sight; sporadic E; meteor and auroral scatter and reflections; tropospheric ducting; F layer skip; radio horizon		
T3C01		T3C01
Why are direct (not via a repeater) UHF signals rarely heard from stations outside your local coverage area?	(C)	Page 4-4
<ul style="list-style-type: none"> A. They are too weak to go very far B. FCC regulations prohibit them from going more than 50 miles C. UHF signals are usually not reflected by the ionosphere D. UHF signals are absorbed by the ionospheric D layer 		
T3C02		T3C02
Which of the following is an advantage of HF vs VHF and higher frequencies?	(C)	Page 4-4
<ul style="list-style-type: none"> A. HF antennas are generally smaller B. HF accommodates wider bandwidth signals C. Long distance ionospheric propagation is far more common on HF D. There is less atmospheric interference (static) on HF 		

T3C03 (B) Page 4-4	<p>T3C03</p> <p>What is a characteristic of VHF signals received via auroral reflection?</p> <ul style="list-style-type: none"> A. Signals from distances of 10,000 or more miles are common B. The signals exhibit rapid fluctuations of strength and often sound distorted C. These types of signals occur only during winter nighttime hours D. These types of signals are generally strongest when your antenna is aimed west
T3C04 (B) Page 4-4	<p>T3C04</p> <p>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?</p> <ul style="list-style-type: none"> A. Backscatter B. Sporadic E C. D layer absorption D. Gray-line propagation
T3C05 (A) Page 4-2	<p>T3C05</p> <p>Which of the following effects might cause radio signals to be heard despite obstructions between the transmitting and receiving stations?</p> <ul style="list-style-type: none"> A. Knife-edge diffraction B. Faraday rotation C. Quantum tunneling D. Doppler shift
T3C06 (A) Page 4-3	<p>T3C06</p> <p>What mode is responsible for allowing over-the-horizon VHF and UHF communications to ranges of approximately 300 miles on a regular basis?</p> <ul style="list-style-type: none"> A. Tropospheric ducting B. D layer refraction C. F2 layer refraction D. Faraday rotation
T3C07 (B) Page 4-4	<p>T3C07</p> <p>What band is best suited for communicating via meteor scatter?</p> <ul style="list-style-type: none"> A. 10 meter band B. 6 meter band C. 2 meter band D. 70 centimeter band
T3C08 (D) Page 4-3	<p>T3C08</p> <p>What causes tropospheric ducting?</p> <ul style="list-style-type: none"> A. Discharges of lightning during electrical storms B. Sunspots and solar flares C. Updrafts from hurricanes and tornadoes D. Temperature inversions in the atmosphere
T3C09 (A) Page 4-4	<p>T3C09</p> <p>What is generally the best time for long-distance 10 meter band propagation via the F layer?</p> <ul style="list-style-type: none"> A. From dawn to shortly after sunset during periods of high sunspot activity B. From shortly after sunset to dawn during periods of high sunspot activity C. From dawn to shortly after sunset during periods of low sunspot activity D. From shortly after sunset to dawn during periods of low sunspot activity

T3C10

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

- A. 6 or 10 meter bands
- B. 23 centimeter band
- C. 70 centimeter or 1.25 meter bands
- D. All of these choices are correct

T3C10

(A)

Page 4-4

T3C11

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

- A. Radio signals move somewhat faster than the speed of light
- B. Radio waves are not blocked by dust particles
- C. The Earth seems less curved to radio waves than to light
- D. Radio waves are blocked by dust particles

T3C11

(C)

Page 4-2

SUBELEMENT T4

Amateur radio practices and station set-up

[2 Exam Questions — 2 Groups]

T4A — Station setup: connecting microphones; reducing unwanted emissions; power source; connecting a computer; RF grounding; connecting digital equipment; connecting an SWR meter

T4A01
(D)
Page 5-16

T4A01

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

- A. Efficiency of the transmitter at full power output
- B. Receiver and control circuit power
- C. Power supply regulation and heat dissipation
- D. All of these choices are correct

T4A02
(D)
Page 5-11

T4A02

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

- A. For logging contacts and contact information
- B. For sending and/or receiving CW
- C. For generating and decoding digital signals
- D. All of these choices are correct

T4A03
(A)
Page 5-17

T4A03

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

- A. To avoid voltage falling below that needed for proper operation
- B. To provide a good counterpoise for the antenna
- C. To avoid RF interference
- D. All of these choices are correct

T4A04
(C)
Page 5-15

T4A04

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

- A. Headphone output
- B. Mute
- C. Microphone or line input
- D. PCI or SDI

T4A05
(A)
Page 4-18

T4A05

What is the proper location for an external SWR meter?

- A. In series with the feed line, between the transmitter and antenna
- B. In series with the station's ground
- C. In parallel with the push-to-talk line and the antenna
- D. In series with the power supply cable, as close as possible to the radio

T4A06
(C)
Page 5-15

T4A06

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

- A. Receive and transmit mode, status, and location
- B. Antenna and RF power
- C. Receive audio, transmit audio, and push-to-talk (PTT)
- D. NMEA GPS location and DC power

<p>T4A07</p> <p>How is a computer's sound card used when conducting digital communications?</p> <ul style="list-style-type: none"> A. The sound card communicates between the computer CPU and the video display B. The sound card records the audio frequency for video display C. The sound card provides audio to the radio's microphone input and converts received audio to digital form D. All of these choices are correct 	<p>T4A07 (C) Page 5-15</p>
<p>T4A08</p> <p>Which of the following conductors provides the lowest impedance to RF signals?</p> <ul style="list-style-type: none"> A. Round stranded wire B. Round copper-clad steel wire C. Twisted-pair cable D. Flat strap 	<p>T4A08 (D) Page 9-7</p>
<p>T4A09</p> <p>Which of the following could you use to cure distorted audio caused by RF current on the shield of a microphone cable?</p> <ul style="list-style-type: none"> A. Band-pass filter B. Low-pass filter C. Preamplifier D. Ferrite choke 	<p>T4A09 (D) Page 9-8</p>
<p>T4A10</p> <p>What is the source of a high-pitched whine that varies with engine speed in a mobile transceiver's receive audio?</p> <ul style="list-style-type: none"> A. The ignition system B. The alternator C. The electric fuel pump D. Anti-lock braking system controllers 	<p>T4A10 (B) Page 5-17</p>
<p>T4A11</p> <p>Where should the negative return connection of a mobile transceiver's power cable be connected?</p> <ul style="list-style-type: none"> A. At the battery or engine block ground strap B. At the antenna mount C. To any metal part of the vehicle D. Through the transceiver's mounting bracket 	<p>T4A11 (A) Page 5-17</p>
<p>T4B — Operating controls: tuning; use of filters; squelch function; AGC; transceiver operation; memory channels</p>	
<p>T4B01</p> <p>What may happen if a transmitter is operated with the microphone gain set too high?</p> <ul style="list-style-type: none"> A. The output power might be too high B. The output signal might become distorted C. The frequency might vary D. The SWR might increase 	<p>T4B01 (B) Page 5-8</p>

T4B02 (A) Page 5-6	T4B02 Which of the following can be used to enter the operating frequency on a modern transceiver? A. The keypad or VFO knob B. The CTCSS or DTMF encoder C. The Automatic Frequency Control D. All of these choices are correct
T4B03 (D) Page 5-9	T4B03 What is the purpose of the squelch control on a transceiver? A. To set the highest level of volume desired B. To set the transmitter power level C. To adjust the automatic gain control D. To mute receiver output noise when no signal is being received
T4B04 (B) Page 5-7	T4B04 What is a way to enable quick access to a favorite frequency on your transceiver? A. Enable the CTCSS tones B. Store the frequency in a memory channel C. Disable the CTCSS tones D. Use the scan mode to select the desired frequency
T4B05 (C) Page 5-10	T4B05 Which of the following would reduce ignition interference to a receiver? A. Change frequency slightly B. Decrease the squelch setting C. Turn on the noise blanker D. Use the RIT control
T4B06 (D) Page 5-10	T4B06 Which of the following controls could be used if the voice pitch of a single-sideband signal seems too high or low? A. The AGC or limiter B. The bandwidth selection C. The tone squelch D. The receiver RIT or clarifier
T4B07 (B) Page 5-10	T4B07 What does the term “RIT” mean? A. Receiver Input Tone B. Receiver Incremental Tuning C. Rectifier Inverter Test D. Remote Input Transmitter
T4B08 (B) Page 5-9	T4B08 What is the advantage of having multiple receive bandwidth choices on a multimode transceiver? A. Permits monitoring several modes at once B. Permits noise or interference reduction by selecting a bandwidth matching the mode C. Increases the number of frequencies that can be stored in memory D. Increases the amount of offset between receive and transmit frequencies

T4B09

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

- A. 500 Hz
- B. 1000 Hz
- C. 2400 Hz
- D. 5000 Hz

T4B09

(C)

Page 5-9

T4B10

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

- A. 500 Hz
- B. 1000 Hz
- C. 2400 Hz
- D. 5000 Hz

T4B10

(A)

Page 5-9

T4B11

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

- A. To keep received audio relatively constant
- B. To protect an antenna from lightning
- C. To eliminate RF on the station cabling
- D. An asymmetric goniometer control used for antenna matching

T4B11

(A)

Page 5-9

T4B12

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

- A. Squelch
- B. Noise blanker
- C. Notch filter
- D. All of these choices are correct

T4B12

(B)

Page 5-10

T4B13

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

- A. To check incoming signal deviation
- B. To prevent interference to nearby repeaters
- C. To scan through a range of frequencies to check for activity
- D. To check for messages left on a digital bulletin board

T4B13

(C)

Page 6-10

SUBELEMENT T5

Electrical principles: math for electronics; electronic principles; Ohm's Law

[4 Exam Questions — 4 Groups]

T5A — Electrical principles, units, and terms: current and voltage; conductors and insulators; alternating and direct current; series and parallel circuits

T5A01
(D)
Page 3-1

T5A01
Electrical current is measured in which of the following units?
A. Volts
B. Watts
C. Ohms
D. Amperes

T5A02
(B)
Page 3-7

T5A02
Electrical power is measured in which of the following units?
A. Volts
B. Watts
C. Ohms
D. Amperes

T5A03
(D)
Page 3-1

T5A03
What is the name for the flow of electrons in an electric circuit?
A. Voltage
B. Resistance
C. Capacitance
D. Current

T5A04
(B)
Page 3-2

T5A04
What is the name for a current that flows only in one direction?
A. Alternating current
B. Direct current
C. Normal current
D. Smooth current

T5A05
(A)
Page 3-1

T5A05
What is the electrical term for the electromotive force (EMF) that causes electron flow?
A. Voltage
B. Ampere-hours
C. Capacitance
D. Inductance

T5A06
(A)
Page 5-16

T5A06
How much voltage does a mobile transceiver typically require?
A. About 12 volts
B. About 30 volts
C. About 120 volts
D. About 240 volts

T5A07		T5A07
Which of the following is a good electrical conductor?		(C)
A. Glass		Page 3-5
B. Wood		
C. Copper		
D. Rubber		
T5A08		T5A08
Which of the following is a good electrical insulator?		(B)
A. Copper		Page 3-5
B. Glass		
C. Aluminum		
D. Mercury		
T5A09		T5A09
What is the name for a current that reverses direction on a regular basis?		(A)
A. Alternating current		Page 3-2
B. Direct current		
C. Circular current		
D. Vertical current		
T5A10		T5A10
Which term describes the rate at which electrical energy is used?		(C)
A. Resistance		Page 3-7
B. Current		
C. Power		
D. Voltage		
T5A11		T5A11
What is the unit of electromotive force?		(A)
A. The volt		Page 3-2
B. The watt		
C. The ampere		
D. The ohm		
T5A12		T5A12
What describes the number of times per second that an alternating current makes a complete cycle?		(D)
A. Pulse rate		Page 2-3
B. Speed		
C. Wavelength		
D. Frequency		
T5A13		T5A13
In which type of circuit is current the same through all components?		(A)
A. Series		Page 3-2
B. Parallel		
C. Resonant		
D. Branch		
T5A14		T5A14
In which type of circuit is voltage the same across all components?		(B)
A. Series		Page 3-2
B. Parallel		
C. Resonant		
D. Branch		

T5B — Math for electronics: conversion of electrical units; decibels; the metric system

T5B01
(C)
Page 2-2

T5B01
How many milliamperes is 1.5 amperes?
A. 15 milliamperes
B. 150 milliamperes
C. 1500 milliamperes
D. 15,000 milliamperes

T5B02
(A)
Page 2-2

T5B02
What is another way to specify a radio signal frequency of 1,500,000 hertz?
A. 1500 kHz
B. 1500 MHz
C. 15 GHz
D. 150 kHz

T5B03
(C)
Page 2-2

T5B03
How many volts are equal to one kilovolt?
A. One one-thousandth of a volt
B. One hundred volts
C. One thousand volts
D. One million volts

T5B04
(A)
Page 2-2

T5B04
How many volts are equal to one microvolt?
A. One one-millionth of a volt
B. One million volts
C. One thousand kilovolts
D. One one-thousandth of a volt

T5B05
(B)
Page 2-2

T5B05
Which of the following is equal to 500 milliwatts?
A. 0.02 watts
B. 0.5 watts
C. 5 watts
D. 50 watts

T5B06
(C)
Page 2-2

T5B06
If an ammeter calibrated in amperes is used to measure a 3000-milliamperere current, what reading would it show?
A. 0.003 amperes
B. 0.3 amperes
C. 3 amperes
D. 3,000,000 amperes

T5B07
(C)
Page 2-2

T5B07
If a frequency display calibrated in megahertz shows a reading of 3.525 MHz, what would it show if it were calibrated in kilohertz?
A. 0.003525 kHz
B. 35.25 kHz
C. 3525 kHz
D. 3,525,000 kHz

T5B08		T5B08
How many microfarads are equal to 1,000,000 picofarads?		(B)
A. 0.001 microfarads		Page 2-2
B. 1 microfarad		
C. 1000 microfarads		
D. 1,000,000,000 microfarads		
T5B09		T5B09
What is the approximate amount of change, measured in decibels (dB), of a power increase from 5 watts to 10 watts?		(B)
A. 2 dB		Page 4-8
B. 3 dB		
C. 5 dB		
D. 10 dB		
T5B10		T5B10
What is the approximate amount of change, measured in decibels (dB), of a power decrease from 12 watts to 3 watts?		(C)
A. -1 dB		Page 4-8
B. -3 dB		
C. -6 dB		
D. -9 dB		
T5B11		T5B11
What is the amount of change, measured in decibels (dB), of a power increase from 20 watts to 200 watts?		(A)
A. 10 dB		Page 4-8
B. 12 dB		
C. 18 dB		
D. 28 dB		
T5B12		T5B12
Which of the following frequencies is equal to 28,400 kHz?		(A)
A. 28.400 MHz		Page 2-2
B. 2.800 MHz		
C. 284.00 MHz		
D. 28.400 kHz		
T5B13		T5B13
If a frequency display shows a reading of 2425 MHz, what frequency is that in GHz?		(C)
A. 0.002425 GHz		Page 2-2
B. 24.25 GHz		
C. 2.425 GHz		
D. 2425 GHz		
T5C — Electronic principles: capacitance; inductance; current flow in circuits; alternating current; definition of RF; definition of polarity; DC power calculations; impedance		
T5C01		T5C01
What is the ability to store energy in an electric field called?		(D)
A. Inductance		Page 3-9
B. Resistance		
C. Tolerance		
D. Capacitance		

T5C02 (A) Page 3-9	T5C02 What is the basic unit of capacitance? A. The farad B. The ohm C. The volt D. The henry
T5C03 (D) Page 3-9	T5C03 What is the ability to store energy in a magnetic field called? A. Admittance B. Capacitance C. Resistance D. Inductance
T5C04 (C) Page 3-9	T5C04 What is the basic unit of inductance? A. The coulomb B. The farad C. The henry D. The ohm
T5C05 (A) Page 2-3	T5C05 What is the unit of frequency? A. Hertz B. Henry C. Farad D. Tesla
T5C06 (A) Page 2-4	T5C06 What does the abbreviation “RF” refer to? A. Radio frequency signals of all types B. The resonant frequency of a tuned circuit C. The real frequency transmitted as opposed to the apparent frequency D. Reflective force in antenna transmission lines
T5C07 (B) Page 4-6	T5C07 A radio wave is made up of what type of energy? A. Pressure B. Electromagnetic C. Gravity D. Thermal
T5C08 (A) Page 3-7	T5C08 What is the formula used to calculate electrical power in a DC circuit? A. Power (P) equals voltage (E) multiplied by current (I) B. Power (P) equals voltage (E) divided by current (I) C. Power (P) equals voltage (E) minus current (I) D. Power (P) equals voltage (E) plus current (I)

<p>T5C09</p> <p>How much power is being used in a circuit when the applied voltage is 13.8 volts DC and the current is 10 amperes?</p> <ul style="list-style-type: none"> A. 138 watts B. 0.7 watts C. 23.8 watts D. 3.8 watts 	<p>T5C09 (A) Page 3-7</p>
<p>T5C10</p> <p>How much power is being used in a circuit when the applied voltage is 12 volts DC and the current is 2.5 amperes?</p> <ul style="list-style-type: none"> A. 4.8 watts B. 30 watts C. 14.5 watts D. 0.208 watts 	<p>T5C10 (B) Page 3-7</p>
<p>T5C11</p> <p>How many amperes are flowing in a circuit when the applied voltage is 12 volts DC and the load is 120 watts?</p> <ul style="list-style-type: none"> A. 0.1 amperes B. 10 amperes C. 12 amperes D. 132 amperes 	<p>T5C11 (B) Page 3-7</p>
<p>T5C12</p> <p>What is impedance?</p> <ul style="list-style-type: none"> A. A measure of the opposition to AC current flow in a circuit B. The inverse of resistance C. The Q or Quality Factor of a component D. The power handling capability of a component 	<p>T5C12 (A) Page 3-10</p>
<p>T5C13</p> <p>What is a unit of impedance?</p> <ul style="list-style-type: none"> A. Volts B. Amperes C. Coulombs D. Ohms 	<p>T5C13 (D) Page 3-10</p>
<p>T5C14</p> <p>What is the proper abbreviation for megahertz?</p> <ul style="list-style-type: none"> A. mHz B. mhZ C. Mhz D. MHz 	<p>T5C14 (D) Page 2-3</p>
<p>T5D — Ohm's Law: formulas and usage; components in series and parallel</p>	
<p>T5D01</p> <p>What formula is used to calculate current in a circuit?</p> <ul style="list-style-type: none"> A. Current (I) equals voltage (E) multiplied by resistance (R) B. Current (I) equals voltage (E) divided by resistance (R) C. Current (I) equals voltage (E) added to resistance (R) D. Current (I) equals voltage (E) minus resistance (R) 	<p>T5D01 (B) Page 3-5</p>

T5D02 (A) Page 3-5	<p>T5D02</p> <p>What formula is used to calculate voltage in a circuit?</p> <ul style="list-style-type: none"> A. Voltage (E) equals current (I) multiplied by resistance (R) B. Voltage (E) equals current (I) divided by resistance (R) C. Voltage (E) equals current (I) added to resistance (R) D. Voltage (E) equals current (I) minus resistance (R)
T5D03 (B) Page 3-5	<p>T5D03</p> <p>What formula is used to calculate resistance in a circuit?</p> <ul style="list-style-type: none"> A. Resistance (R) equals voltage (E) multiplied by current (I) B. Resistance (R) equals voltage (E) divided by current (I) C. Resistance (R) equals voltage (E) added to current (I) D. Resistance (R) equals voltage (E) minus current (I)
T5D04 (B) Page 3-6	<p>T5D04</p> <p>What is the resistance of a circuit in which a current of 3 amperes flows through a resistor connected to 90 volts?</p> <ul style="list-style-type: none"> A. 3 ohms B. 30 ohms C. 93 ohms D. 270 ohms
T5D05 (C) Page 3-6	<p>T5D05</p> <p>What is the resistance in a circuit for which the applied voltage is 12 volts and the current flow is 1.5 amperes?</p> <ul style="list-style-type: none"> A. 18 ohms B. 0.125 ohms C. 8 ohms D. 13.5 ohms
T5D06 (A) Page 3-6	<p>T5D06</p> <p>What is the resistance of a circuit that draws 4 amperes from a 12-volt source?</p> <ul style="list-style-type: none"> A. 3 ohms B. 16 ohms C. 48 ohms D. 8 ohms
T5D07 (D) Page 3-6	<p>T5D07</p> <p>What is the current in a circuit with an applied voltage of 120 volts and a resistance of 80 ohms?</p> <ul style="list-style-type: none"> A. 9600 amperes B. 200 amperes C. 0.667 amperes D. 1.5 amperes
T5D08 (C) Page 3-6	<p>T5D08</p> <p>What is the current through a 100-ohm resistor connected across 200 volts?</p> <ul style="list-style-type: none"> A. 20,000 amperes B. 0.5 amperes C. 2 amperes D. 100 amperes

T5D09		T5D09
What is the current through a 24-ohm resistor connected across 240 volts?		(C)
A. 24,000 amperes		Page 3-6
B. 0.1 amperes		
C. 10 amperes		
D. 216 amperes		
T5D10		T5D10
What is the voltage across a 2-ohm resistor if a current of 0.5 amperes flows through it?		(A)
A. 1 volt		Page 3-6
B. 0.25 volts		
C. 2.5 volts		
D. 1.5 volts		
T5D11		T5D11
What is the voltage across a 10-ohm resistor if a current of 1 ampere flows through it?		(B)
A. 1 volt		Page 3-7
B. 10 volts		
C. 11 volts		
D. 9 volts		
T5D12		T5D12
What is the voltage across a 10-ohm resistor if a current of 2 amperes flows through it?		(D)
A. 8 volts		Page 3-7
B. 0.2 volts		
C. 12 volts		
D. 20 volts		
T5D13		T5D13
What happens to current at the junction of two components in series?		(B)
A. It divides equally between them		Page 3-2
B. It is unchanged		
C. It divides based on the on the value of the components		
D. The current in the second component is zero		
T5D14		T5D14
What happens to current at the junction of two components in parallel?		(A)
A. It divides between them dependent on the value of the components		Page 3-2
B. It is the same in both components		
C. Its value doubles		
D. Its value is halved		
T5D15		T5D15
What is the voltage across each of two components in series with a voltage source?		(C)
A. The same voltage as the source		Page 3-2
B. Half the source voltage		
C. It is determined by the type and value of the components		
D. Twice the source voltage		
T5D16		T5D16
What is the voltage across each of two components in parallel with a voltage source?		(D)
A. It is determined by the type and value of the components		Page 3-3
B. Half the source voltage		
C. Twice the source voltage		
D. The same voltage as the source		

SUBELEMENT T6

Electrical components; circuit diagrams; component functions [4 Exam Questions – 4 Groups]

T6A — Electrical components: fixed and variable resistors; capacitors and inductors; fuses; switches; batteries

T6A01
(B)
Page 3-9

T6A01
What electrical component opposes the flow of current in a DC circuit?
A. Inductor
B. Resistor
C. Voltmeter
D. Transformer

T6A02
(C)
Page 3-9

T6A02
What type of component is often used as an adjustable volume control?
A. Fixed resistor
B. Power resistor
C. Potentiometer
D. Transformer

T6A03
(B)
Page 3-9

T6A03
What electrical parameter is controlled by a potentiometer?
A. Inductance
B. Resistance
C. Capacitance
D. Field strength

T6A04
(B)
Page 3-9

T6A04
What electrical component stores energy in an electric field?
A. Resistor
B. Capacitor
C. Inductor
D. Diode

T6A05
(D)
Page 3-9

T6A05
What type of electrical component consists of two or more conductive surfaces separated by an insulator?
A. Resistor
B. Potentiometer
C. Oscillator
D. Capacitor

T6A06
(C)
Page 3-9

T6A06
What type of electrical component stores energy in a magnetic field?
A. Resistor
B. Capacitor
C. Inductor
D. Diode

T6A07		T6A07
What electrical component usually is constructed as a coil of wire?		(D)
A. Switch		Page 3-9
B. Capacitor		
C. Diode		
D. Inductor		
T6A08		T6A08
What electrical component is used to connect or disconnect electrical circuits?		(B)
A. Magnetron		Page 3-13
B. Switch		
C. Thermistor		
D. All of these choices are correct		
T6A09		T6A09
What electrical component is used to protect other circuit components from current overloads?		(A)
A. Fuse		Page 3-12
B. Capacitor		
C. Inductor		
D. All of these choices are correct		
T6A10		T6A10
Which of the following battery types is rechargeable?		(D)
A. Nickel-metal hydride		Page 5-17
B. Lithium-ion		
C. Lead-acid gel-cell		
D. All of these choices are correct		
T6A11		T6A11
Which of the following battery types is not rechargeable?		(B)
A. Nickel-cadmium		Page 5-17
B. Carbon-zinc		
C. Lead-acid		
D. Lithium-ion		
T6B — Semiconductors: basic principles and applications of solid state devices; diodes and transistors		
T6B01		T6B01
What class of electronic components uses a voltage or current signal to control current flow?		(D)
A. Capacitors		Page 3-12
B. Inductors		
C. Resistors		
D. Transistors		
T6B02		T6B02
What electronic component allows current to flow in only one direction?		(C)
A. Resistor		Page 3-12
B. Fuse		
C. Diode		
D. Driven element		

T6B03 (C) Page 3-12	<p>T6B03</p> <p>Which of these components can be used as an electronic switch or amplifier?</p> <ul style="list-style-type: none"> A. Oscillator B. Potentiometer C. Transistor D. Voltmeter
T6B04 (B) Page 3-12	<p>T6B04</p> <p>Which of the following components can consist of three layers of semiconductor material?</p> <ul style="list-style-type: none"> A. Alternator B. Transistor C. Triode D. Pentagrid converter
T6B05 (A) Page 3-12	<p>T6B05</p> <p>Which of the following electronic components can amplify signals?</p> <ul style="list-style-type: none"> A. Transistor B. Variable resistor C. Electrolytic capacitor D. Multi-cell battery
T6B06 (B) Page 3-12	<p>T6B06</p> <p>How is the cathode lead of a semiconductor diode often marked on the package?</p> <ul style="list-style-type: none"> A. With the word “cathode” B. With a stripe C. With the letter C D. With the letter K
T6B07 (B) Page 3-12	<p>T6B07</p> <p>What does the abbreviation LED stand for?</p> <ul style="list-style-type: none"> A. Low Emission Diode B. Light Emitting Diode C. Liquid Emission Detector D. Long Echo Delay
T6B08 (A) Page 3-12	<p>T6B08</p> <p>What does the abbreviation FET stand for?</p> <ul style="list-style-type: none"> A. Field Effect Transistor B. Fast Electron Transistor C. Free Electron Transmitter D. Frequency Emission Transmitter
T6B09 (C) Page 3-12	<p>T6B09</p> <p>What are the names of the two electrodes of a diode?</p> <ul style="list-style-type: none"> A. Plus and minus B. Source and drain C. Anode and cathode D. Gate and base

T6B10

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

- A. Transformer
- B. Transistor
- C. Reactor
- D. Resistor

T6B10

(B)

Page 3-12

T6B11

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

- A. Gain
- B. Forward resistance
- C. Forward voltage drop
- D. On resistance

T6B11

(A)

Page 3-12

T6C — Circuit diagrams; schematic symbols

T6C01

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

- A. Bill of materials
- B. Connector pinout
- C. Schematic
- D. Flow chart

T6C01

(C)

Page 3-14

T6C02

What is component 1 in figure T1?

- A. Resistor
- B. Transistor
- C. Battery
- D. Connector

T6C02

(A)

Page 3-16

T6C03

What is component 2 in figure T1?

- A. Resistor
- B. Transistor
- C. Indicator lamp
- D. Connector

T6C03

(B)

Page 3-16

T6C04

What is component 3 in figure T1?

- A. Resistor
- B. Transistor
- C. Lamp
- D. Ground symbol

T6C04

(C)

Page 3-16

T6C05

What is component 4 in figure T1?

- A. Resistor
- B. Transistor
- C. Battery
- D. Ground symbol

T6C05

(C)

Page 3-16

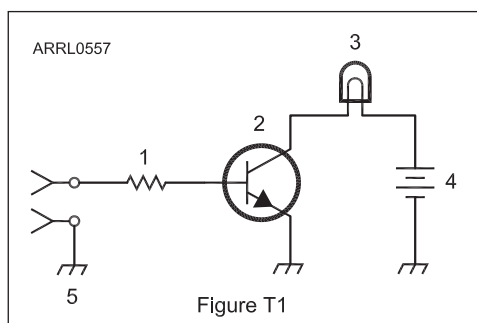


Figure T1 — Refer to this figure for questions T6C02 through T6C05 and T6D10.

T6C06
(B)
Page 3-16

T6C06
What is component 6 in figure T2?
A. Resistor
B. Capacitor
C. Regulator IC
D. Transistor

T6C07
(D)
Page 3-16

T6C07
What is component 8 in figure T2?
A. Resistor
B. Inductor
C. Regulator IC
D. Light emitting diode

T6C08
(C)
Page 3-16

T6C08
What is component 9 in figure T2?
A. Variable capacitor
B. Variable inductor
C. Variable resistor
D. Variable transformer

T6C09
(D)
Page 3-16

T6C09
What is component 4 in figure T2?
A. Variable inductor
B. Double-pole switch
C. Potentiometer
D. Transformer

T6C10
(D)
Page 3-16

T6C10
What is component 3 in figure T3?
A. Connector
B. Meter
C. Variable capacitor
D. Variable inductor

T6C11
(A)
Page 3-16

T6C11
What is component 4 in figure T3?
A. Antenna
B. Transmitter
C. Dummy load
D. Ground

T6C12
(A)
Page 3-14

T6C12
What do the symbols on an electrical schematic represent?
A. Electrical components
B. Logic states
C. Digital codes
D. Traffic nodes

T6C13
(C)
Page 3-14

T6C13
Which of the following is accurately represented in electrical schematics?
A. Wire lengths
B. Physical appearance of components
C. The way components are interconnected
D. All of these choices are correct

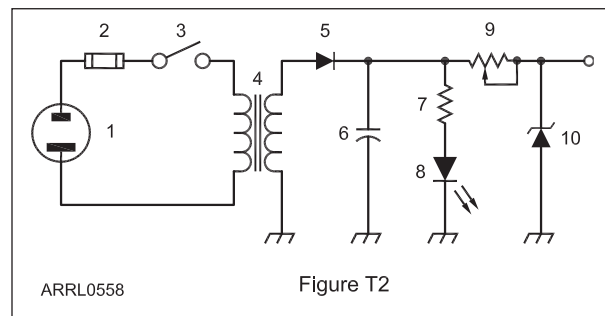


Figure T2 — Refer to this figure for questions T6C06 through T6C09 and T6D03.

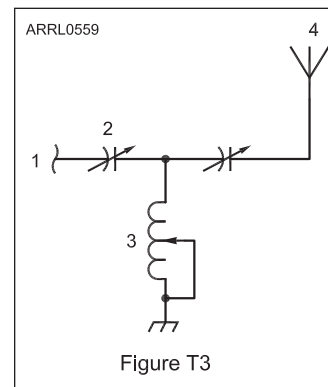


Figure T3 — Refer to this figure for questions T6C10 and T6C11.

T6D — Component functions: rectification; switches; indicators; power supply components; resonant circuit; shielding; power transformers; integrated circuits

T6D01

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

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

T6D01

(B)

Page 3-12

T6D02

What is a relay?

- A. An electrically-controlled switch
- B. A current controlled amplifier
- C. An optical sensor
- D. A pass transistor

T6D02

(A)

Page 3-13

T6D03

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

- A. Single-pole single-throw
- B. Single-pole double-throw
- C. Double-pole single-throw
- D. Double-pole double-throw

T6D03

(A)

Page 3-14

T6D04

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

- A. Potentiometer
- B. Transistor
- C. Meter
- D. Relay

T6D04

(C)

Page 3-14

T6D05

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

- A. Regulator
- B. Oscillator
- C. Filter
- D. Phase inverter

T6D05

(A)

Page 5-16

T6D06

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

- A. Variable capacitor
- B. Transformer
- C. Transistor
- D. Diode

T6D06

(B)

Page 3-9

T6D07

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

- A. LED
- B. FET
- C. Zener diode
- D. Bipolar transistor

T6D07

(A)

Page 3-12

T6D08 (D) Page 3-10	<p>T6D08</p> <p>Which of the following is combined with an inductor to make a tuned circuit?</p> <ul style="list-style-type: none"> A. Resistor B. Zener diode C. Potentiometer D. Capacitor
T6D09 (C) Page 3-12	<p>T6D09</p> <p>What is the name of a device that combines several semiconductors and other components into one package?</p> <ul style="list-style-type: none"> A. Transducer B. Multi-pole relay C. Integrated circuit D. Transformer
T6D10 (C) Page 3-12	<p>T6D10</p> <p>What is the function of component 2 in Figure T1?</p> <ul style="list-style-type: none"> A. Give off light when current flows through it B. Supply electrical energy C. Control the flow of current D. Convert electrical energy into radio waves
T6D11 (A) Page 3-10	<p>T6D11</p> <p>Which of the following is a resonant or tuned circuit?</p> <ul style="list-style-type: none"> A. An inductor and a capacitor connected in series or parallel to form a filter B. A type of voltage regulator C. A resistor circuit used for reducing standing wave ratio D. A circuit designed to provide high-fidelity audio
T6D12 (C) Page 9-9	<p>T6D12</p> <p>Which of the following is a common reason to use shielded wire?</p> <ul style="list-style-type: none"> A. To decrease the resistance of DC power connections B. To increase the current carrying capability of the wire C. To prevent coupling of unwanted signals to or from the wire D. To couple the wire to other signals

SUBELEMENT T7

Station equipment: common transmitter and receiver problems; antenna measurements; troubleshooting; basic repair and testing [4 Exam Questions — 4 Groups]

T7A — Station equipment: receivers; transmitters; transceivers; modulation; transverters; transmit and receive amplifiers

T7A01

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

- A. Linearity
- B. Sensitivity
- C. Selectivity
- D. Total Harmonic Distortion

T7A01

(B)

Page 5-9

T7A02

What is a transceiver?

- A. A type of antenna switch
- B. A unit combining the functions of a transmitter and a receiver
- C. A component in a repeater that filters out unwanted interference
- D. A type of antenna matching network

T7A02

(B)

Page 2-7

T7A03

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

- A. Phase splitter
- B. Mixer
- C. Inverter
- D. Amplifier

T7A03

(B)

Page 3-18

T7A04

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

- A. Discrimination ratio
- B. Sensitivity
- C. Selectivity
- D. Harmonic distortion

T7A04

(C)

Page 5-9

T7A05

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

- A. Reactance modulator
- B. Product detector
- C. Low-pass filter
- D. Oscillator

T7A05

(D)

Page 3-17

T7A06

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

- A. High-pass filter
- B. Low-pass filter
- C. Transverter
- D. Phase converter

T7A06

(C)

Page 5-11

T7A07 (D) Page 5-7	<p>T7A07</p> <p>What is meant by “PTT”?</p> <ul style="list-style-type: none"> A. Pre-transmission tuning to reduce transmitter harmonic emission B. Precise tone transmissions used to limit repeater access to only certain signals C. A primary transformer tuner use to match antennas D. The push-to-talk function that switches between receive and transmit
T7A08 (C) Page 3-17	<p>T7A08</p> <p>Which of the following describes combining speech with an RF carrier signal?</p> <ul style="list-style-type: none"> A. Impedance matching B. Oscillation C. Modulation D. Low-pass filtering
T7A09 (B) Page 5-10	<p>T7A09</p> <p>What is the function of the SSB/CW-FM switch on a VHF power amplifier?</p> <ul style="list-style-type: none"> A. Change the mode of the transmitted signal B. Set the amplifier for proper operation in the selected mode C. Change the frequency range of the amplifier to operate in the proper portion of the band D. Reduce the received signal noise
T7A10 (B) Page 5-10	<p>T7A10</p> <p>What device increases the low-power output from a handheld transceiver?</p> <ul style="list-style-type: none"> A. A voltage divider B. An RF power amplifier C. An impedance network D. All of these choices are correct
T7A11 (A) Page 5-9	<p>T7A11</p> <p>Where is an RF preamplifier installed?</p> <ul style="list-style-type: none"> A. Between the antenna and receiver B. At the output of the transmitter’s power amplifier C. Between a transmitter and antenna tuner D. At the receiver’s audio output
	<p>T7B — Common transmitter and receiver problems: symptoms of overload and overdrive; distortion; causes of interference; interference and consumer electronics; part 15 devices; over-modulation; RF feedback; off frequency signals</p>
T7B01 (D) Page 5-8	<p>T7B01</p> <p>What can you do if you are told your FM handheld or mobile transceiver is over-deviating?</p> <ul style="list-style-type: none"> A. Talk louder into the microphone B. Let the transceiver cool off C. Change to a higher power level D. Talk farther away from the microphone
T7B02 (A) Page 9-8	<p>T7B02</p> <p>What would cause a broadcast AM or FM radio to receive an amateur radio transmission unintentionally?</p> <ul style="list-style-type: none"> A. The receiver is unable to reject strong signals outside the AM or FM band B. The microphone gain of the transmitter is turned up too high C. The audio amplifier of the transmitter is overloaded D. The deviation of an FM transmitter is set too low

<p>T7B03</p> <p>Which of the following can cause radio frequency interference?</p> <ul style="list-style-type: none"> A. Fundamental overload B. Harmonics C. Spurious emissions D. All of these choices are correct 	<p>T7B03 (D) Page 9-8</p>
<p>T7B04</p> <p>Which of the following is a way to reduce or eliminate interference from an amateur transmitter to a nearby telephone?</p> <ul style="list-style-type: none"> A. Put a filter on the amateur transmitter B. Reduce the microphone gain C. Reduce the SWR on the transmitter transmission line D. Put an RF filter on the telephone 	<p>T7B04 (D) Page 9-8</p>
<p>T7B05</p> <p>How can overload of a non-amateur radio or TV receiver by an amateur signal be reduced or eliminated?</p> <ul style="list-style-type: none"> A. Block the amateur signal with a filter at the antenna input of the affected receiver B. Block the interfering signal with a filter on the amateur transmitter C. Switch the transmitter from FM to SSB D. Switch the transmitter to a narrow-band mode 	<p>T7B05 (A) Page 9-9</p>
<p>T7B06</p> <p>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?</p> <ul style="list-style-type: none"> A. 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 B. Immediately turn off your transmitter and contact the nearest FCC office for assistance C. Tell them that your license gives you the right to transmit and nothing can be done to reduce the interference D. Install a harmonic doubler on the output of your transmitter and tune it until the interference is eliminated 	<p>T7B06 (A) Page 9-9</p>
<p>T7B07</p> <p>Which of the following can reduce overload to a VHF transceiver from a nearby FM broadcast station?</p> <ul style="list-style-type: none"> A. RF preamplifier B. Double-shielded coaxial cable C. Using headphones instead of the speaker D. Band-reject filter 	<p>T7B07 (D) Page 9-9</p>
<p>T7B08</p> <p>What should you do if something in a neighbor's home is causing harmful interference to your amateur station?</p> <ul style="list-style-type: none"> A. Work with your neighbor to identify the offending device B. Politely inform your neighbor about the rules that prohibit the use of devices that cause interference C. Check your station and make sure it meets the standards of good amateur practice D. All of these choices are correct 	<p>T7B08 (D) Page 9-10</p>

T7B09 (A) Page 9-10	<p>T7B09</p> <p>What is a Part 15 device?</p> <ul style="list-style-type: none"> A. An unlicensed device that may emit low-powered radio signals on frequencies used by a licensed service B. An amplifier that has been type-certified for amateur radio C. A device for long-distance communications using special codes sanctioned by the International Amateur Radio Union D. A type of test set used to determine whether a transmitter complies with FCC regulation 91.15
T7B10 (D) Page 6-5	<p>T7B10</p> <p>What might be a problem if you receive a report that your audio signal through the repeater is distorted or unintelligible?</p> <ul style="list-style-type: none"> A. Your transmitter is slightly off frequency B. Your batteries are running low C. You are in a bad location D. All of these choices are correct
T7B11 (C) Page 9-6	<p>T7B11</p> <p>What is a symptom of RF feedback in a transmitter or transceiver?</p> <ul style="list-style-type: none"> A. Excessive SWR at the antenna connection B. The transmitter will not stay on the desired frequency C. Reports of garbled, distorted, or unintelligible voice transmissions D. Frequent blowing of power supply fuses
T7B12 (D) Page 9-9	<p>T7B12</p> <p>What should be the first step to resolve cable TV interference from your ham radio transmission?</p> <ul style="list-style-type: none"> A. Add a low-pass filter to the TV antenna input B. Add a high-pass filter to the TV antenna input C. Add a preamplifier to the TV antenna input D. Be sure all TV coaxial connectors are installed properly
	<p>T7C — Antenna measurements and troubleshooting: measuring SWR; dummy loads; coaxial cables; causes of feed line failures</p>
T7C01 (A) Page 5-7	<p>T7C01</p> <p>What is the primary purpose of a dummy load?</p> <ul style="list-style-type: none"> A. To prevent transmitting signals over the air when making tests B. To prevent over-modulation of a transmitter C. To improve the efficiency of an antenna D. To improve the signal-to-noise ratio of a receiver
T7C02 (B) Page 4-19	<p>T7C02</p> <p>Which of the following instruments can be used to determine if an antenna is resonant at the desired operating frequency?</p> <ul style="list-style-type: none"> A. A VTVM B. An antenna analyzer C. A Q meter D. A frequency counter

T7C03		T7C03
What, in general terms, is standing wave ratio (SWR)?		(A)
A. A measure of how well a load is matched to a transmission line		Page 4-11
B. The ratio of high to low impedance in a feed line		
C. The transmitter efficiency ratio		
D. An indication of the quality of your station's ground connection		
T7C04		T7C04
What reading on an SWR meter indicates a perfect impedance match between the antenna and the feed line?		(C)
A. 2 to 1		Page 4-11
B. 1 to 3		
C. 1 to 1		
D. 10 to 1		
T7C05		T7C05
Why do most solid-state amateur radio transmitters reduce output power as SWR increases?		(A)
A. To protect the output amplifier transistors		Page 4-11
B. To comply with FCC rules on spectral purity		
C. Because power supplies cannot supply enough current at high SWR		
D. To improve the impedance match to the feed line		
T7C06		T7C06
What does an SWR reading of 4:1 indicate?		(D)
A. Loss of -4 dB		Page 4-11
B. Good impedance match		
C. Gain of +4 dB		
D. Impedance mismatch		
T7C07		T7C07
What happens to power lost in a feed line?		(C)
A. It increases the SWR		Page 4-9
B. It comes back into your transmitter and could cause damage		
C. It is converted into heat		
D. It can cause distortion of your signal		
T7C08		T7C08
What instrument other than an SWR meter could you use to determine if a feed line and antenna are properly matched?		(D)
A. Voltmeter		Page 4-19
B. Ohmmeter		
C. Iambic pentameter		
D. Directional wattmeter		
T7C09		T7C09
Which of the following is the most common cause for failure of coaxial cables?		(A)
A. Moisture contamination		Page 4-17
B. Gamma rays		
C. The velocity factor exceeds 1.0		
D. Overloading		
T7C10		T7C10
Why should the outer jacket of coaxial cable be resistant to ultraviolet light?		(D)
A. Ultraviolet resistant jackets prevent harmonic radiation		Page 4-17
B. Ultraviolet light can increase losses in the cable's jacket		
C. Ultraviolet and RF signals can mix, causing interference		
D. Ultraviolet light can damage the jacket and allow water to enter the cable		

T7C11 (C) Page 4-18	<p>T7C11</p> <p>What is a disadvantage of air core coaxial cable when compared to foam or solid dielectric types?</p> <ul style="list-style-type: none"> A. It has more loss per foot B. It cannot be used for VHF or UHF antennas C. It requires special techniques to prevent water absorption D. It cannot be used at below freezing temperatures
T7C12 (B) Page 5-7	<p>T7C12</p> <p>What does a dummy load consist of?</p> <ul style="list-style-type: none"> A. A high-gain amplifier and a TR switch B. A non-inductive resistor and a heat sink C. A low-voltage power supply and a DC relay D. A 50 ohm reactance used to terminate a transmission line <p>T7D — Basic repair and testing: soldering; using basic test instruments; connecting a voltmeter, ammeter, or ohmmeter</p>
T7D01 (B) Page 3-2	<p>T7D01</p> <p>Which instrument would you use to measure electric potential or electromotive force?</p> <ul style="list-style-type: none"> A. An ammeter B. A voltmeter C. A wavemeter D. An ohmmeter
T7D02 (B) Page 3-3	<p>T7D02</p> <p>What is the correct way to connect a voltmeter to a circuit?</p> <ul style="list-style-type: none"> A. In series with the circuit B. In parallel with the circuit C. In quadrature with the circuit D. In phase with the circuit
T7D03 (A) Page 3-3	<p>T7D03</p> <p>How is a simple ammeter connected to a circuit?</p> <ul style="list-style-type: none"> A. In series with the circuit B. In parallel with the circuit C. In quadrature with the circuit D. In phase with the circuit
T7D04 (D) Page 3-1	<p>T7D04</p> <p>Which instrument is used to measure electric current?</p> <ul style="list-style-type: none"> A. An ohmmeter B. A wavemeter C. A voltmeter D. An ammeter
T7D05 (D) Page 3-5	<p>T7D05</p> <p>What instrument is used to measure resistance?</p> <ul style="list-style-type: none"> A. An oscilloscope B. A spectrum analyzer C. A noise bridge D. An ohmmeter

T7D06		T7D06
Which of the following might damage a multimeter?		(C)
A. Measuring a voltage too small for the chosen scale		Page 3-4
B. Leaving the meter in the milliamps position overnight		
C. Attempting to measure voltage when using the resistance setting		
D. Not allowing it to warm up properly		
T7D07		T7D07
Which of the following measurements are commonly made using a multimeter?		(D)
A. SWR and RF power		Page 3-4
B. Signal strength and noise		
C. Impedance and reactance		
D. Voltage and resistance		
T7D08		T7D08
Which of the following types of solder is best for radio and electronic use?		(C)
A. Acid-core solder		Page 4-18
B. Silver solder		
C. Rosin-core solder		
D. Aluminum solder		
T7D09		T7D09
What is the characteristic appearance of a cold solder joint?		(C)
A. Dark black spots		Page 4-18
B. A bright or shiny surface		
C. A grainy or dull surface		
D. A greenish tint		
T7D10		T7D10
What is probably happening when an ohmmeter, connected across an unpowered circuit, initially indicates a low resistance and then shows increasing resistance with time?		(B)
A. The ohmmeter is defective		Page 3-4
B. The circuit contains a large capacitor		
C. The circuit contains a large inductor		
D. The circuit is a relaxation oscillator		
T7D11		T7D11
Which of the following precautions should be taken when measuring circuit resistance with an ohmmeter?		(B)
A. Ensure that the applied voltages are correct		Page 3-4
B. Ensure that the circuit is not powered		
C. Ensure that the circuit is grounded		
D. Ensure that the circuit is operating at the correct frequency		
T7D12		T7D12
Which of the following precautions should be taken when measuring high voltages with a voltmeter?		(B)
A. Ensure that the voltmeter has very low impedance		Page 3-4
B. Ensure that the voltmeter and leads are rated for use at the voltages to be measured		
C. Ensure that the circuit is grounded through the voltmeter		
D. Ensure that the voltmeter is set to the correct frequency		

SUBELEMENT T8

Modulation modes: amateur satellite operation; operating activities; non-voice and digital communications [4 Exam Questions — 4 Groups]

T8A — Modulation modes: bandwidth of various signals; choice of emission type

T8A01 (C) Page 5-3	T8A01 Which of the following is a form of amplitude modulation? A. Spread spectrum B. Packet radio C. Single sideband D. Phase shift keying (PSK)
T8A02 (A) Page 5-4	T8A02 What type of modulation is most commonly used for VHF packet radio transmissions? A. FM B. SSB C. AM D. PSK
T8A03 (C) Page 5-4	T8A03 Which type of voice mode is most often used for long-distance (weak signal) contacts on the VHF and UHF bands? A. FM B. DRM C. SSB D. PM
T8A04 (D) Page 5-4	T8A04 Which type of modulation is most commonly used for VHF and UHF voice repeaters? A. AM B. SSB C. PSK D. FM
T8A05 (C) Page 5-5	T8A05 Which of the following types of emission has the narrowest bandwidth? A. FM voice B. SSB voice C. CW D. Slow-scan TV
T8A06 (A) Page 5-5	T8A06 Which sideband is normally used for 10 meter HF, VHF, and UHF single-sideband communications? A. Upper sideband B. Lower sideband C. Suppressed sideband D. Inverted sideband

T8A07		T8A07
What is an advantage of single sideband (SSB) over FM for voice transmissions?		(C)
A. SSB signals are easier to tune		Page 5-4
B. SSB signals are less susceptible to interference		
C. SSB signals have narrower bandwidth		
D. All of these choices are correct		
T8A08		T8A08
What is the approximate bandwidth of a single sideband (SSB) voice signal?		(B)
A. 1 kHz		Page 5-5
B. 3 kHz		
C. 6 kHz		
D. 15 kHz		
T8A09		T8A09
What is the approximate bandwidth of a VHF repeater FM phone signal?		(C)
A. Less than 500 Hz		Page 5-5
B. About 150 kHz		
C. Between 10 and 15 kHz		
D. Between 50 and 125 kHz		
T8A10		T8A10
What is the typical bandwidth of analog fast-scan TV transmissions on the 70 centimeter band?		(B)
A. More than 10 MHz		Page 5-5
B. About 6 MHz		
C. About 3 MHz		
D. About 1 MHz		
T8A11		T8A11
What is the approximate maximum bandwidth required to transmit a CW signal?		(B)
A. 2.4 kHz		Page 5-5
B. 150 Hz		
C. 1000 Hz		
D. 15 kHz		
T8B — Amateur satellite operation; Doppler shift; basic orbits; operating protocols; transmitter power considerations; telemetry and telecommand; satellite tracking		
T8B01		T8B01
What telemetry information is typically transmitted by satellite beacons?		(C)
A. The signal strength of received signals		Page 6-24
B. Time of day accurate to plus or minus 1/10 second		
C. Health and status of the satellite		
D. All of these choices are correct		
T8B02		T8B02
What is the impact of using too much effective radiated power on a satellite uplink?		(B)
A. Possibility of commanding the satellite to an improper mode		Page 6-24
B. Blocking access by other users		
C. Overloading the satellite batteries		
D. Possibility of rebooting the satellite control computer		

T8B03 (D) Page 6-23	<p>T8B03</p> <p>Which of the following are provided by satellite tracking programs?</p> <ul style="list-style-type: none"> A. Maps showing the real-time position of the satellite track over the earth B. The time, azimuth, and elevation of the start, maximum altitude, and end of a pass C. The apparent frequency of the satellite transmission, including effects of Doppler shift D. All of these choices are correct
T8B04 (D) Page 6-24	<p>T8B04</p> <p>What mode of transmission is commonly used by amateur radio satellites?</p> <ul style="list-style-type: none"> A. SSB B. FM C. CW/data D. All of these choices are correct
T8B05 (D) Page 6-22	<p>T8B05</p> <p>What is a satellite beacon?</p> <ul style="list-style-type: none"> A. The primary transmit antenna on the satellite B. An indicator light that shows where to point your antenna C. A reflective surface on the satellite D. A transmission from a satellite that contains status information
T8B06 (B) Page 6-23	<p>T8B06</p> <p>Which of the following are inputs to a satellite tracking program?</p> <ul style="list-style-type: none"> A. The weight of the satellite B. The Keplerian elements C. The last observed time of zero Doppler shift D. All of these choices are correct
T8B07 (C) Page 6-23	<p>T8B07</p> <p>With regard to satellite communications, what is Doppler shift?</p> <ul style="list-style-type: none"> A. A change in the satellite orbit B. A mode where the satellite receives signals on one band and transmits on another C. An observed change in signal frequency caused by relative motion between the satellite and the earth station D. A special digital communications mode for some satellites
T8B08 (B) Page 6-24	<p>T8B08</p> <p>What is meant by the statement that a satellite is operating in mode U/V?</p> <ul style="list-style-type: none"> A. The satellite uplink is in the 15 meter band and the downlink is in the 10 meter band B. The satellite uplink is in the 70 centimeter band and the downlink is in the 2 meter band C. The satellite operates using ultraviolet frequencies D. The satellite frequencies are usually variable
T8B09 (B) Page 6-23	<p>T8B09</p> <p>What causes spin fading of satellite signals?</p> <ul style="list-style-type: none"> A. Circular polarized noise interference radiated from the sun B. Rotation of the satellite and its antennas C. Doppler shift of the received signal D. Interfering signals within the satellite uplink band

T8B10		T8B10
What do the initials LEO tell you about an amateur satellite?		(C)
<ul style="list-style-type: none"> A. The satellite battery is in Low Energy Operation mode B. The satellite is performing a Lunar Ejection Orbit maneuver C. The satellite is in a Low Earth Orbit D. The satellite uses Light Emitting Optics 		Page 6-23
T8B11		T8B11
Who may receive telemetry from a space station?		(A)
<ul style="list-style-type: none"> A. Anyone who can receive the telemetry signal B. A licensed radio amateur with a transmitter equipped for interrogating the satellite C. A licensed radio amateur who has been certified by the protocol developer D. A licensed radio amateur who has registered for an access code from AMSAT 		Page 6-24
T8B12		T8B12
Which of the following is a good way to judge whether your uplink power is neither too low nor too high?		(C)
<ul style="list-style-type: none"> A. Check your signal strength report in the telemetry data B. Listen for distortion on your downlink signal C. Your signal strength on the downlink should be about the same as the beacon D. All of these choices are correct 		Page 6-24
T8C — Operating activities: radio direction finding; radio control; contests; linking over the internet; grid locators		
T8C01		T8C01
Which of the following methods is used to locate sources of noise interference or jamming?		(C)
<ul style="list-style-type: none"> A. Echolocation B. Doppler radar C. Radio direction finding D. Phase locking 		Page 6-10
T8C02		T8C02
Which of these items would be useful for a hidden transmitter hunt?		(B)
<ul style="list-style-type: none"> A. Calibrated SWR meter B. A directional antenna C. A calibrated noise bridge D. All of these choices are correct 		Page 6-10
T8C03		T8C03
What operating activity involves contacting as many stations as possible during a specified period?		(A)
<ul style="list-style-type: none"> A. Contesting B. Net operations C. Public service events D. Simulated emergency exercises 		Page 6-9
T8C04		T8C04
Which of the following is good procedure when contacting another station in a radio contest?		(C)
<ul style="list-style-type: none"> A. Sign only the last two letters of your call if there are many other stations calling B. Contact the station twice to be sure that you are in his log C. Send only the minimum information needed for proper identification and the contest exchange D. All of these choices are correct 		Page 6-9

T8C05 (A) Page 6-8	<p>T8C05</p> <p>What is a grid locator?</p> <ul style="list-style-type: none"> A. A letter-number designator assigned to a geographic location B. A letter-number designator assigned to an azimuth and elevation C. An instrument for neutralizing a final amplifier D. An instrument for radio direction finding
T8C06 (B) Page 6-15	<p>T8C06</p> <p>How is access to some IRLP nodes accomplished?</p> <ul style="list-style-type: none"> A. By obtaining a password that is sent via voice to the node B. By using DTMF signals C. By entering the proper internet password D. By using CTCSS tone codes
T8C07 (D) Page 6-14	<p>T8C07</p> <p>What is meant by Voice Over Internet Protocol (VoIP) as used in amateur radio?</p> <ul style="list-style-type: none"> A. A set of rules specifying how to identify your station when linked over the internet to another station B. A set of guidelines for contacting DX stations during contests using internet access C. A technique for measuring the modulation quality of a transmitter using remote sites monitored via the internet D. A method of delivering voice communications over the internet using digital techniques
T8C08 (A) Page 6-14	<p>T8C08</p> <p>What is the Internet Radio Linking Project (IRLP)?</p> <ul style="list-style-type: none"> A. A technique to connect amateur radio systems, such as repeaters, via the internet using Voice Over Internet Protocol (VoIP) B. A system for providing access to websites via amateur radio C. A system for informing amateurs in real time of the frequency of active DX stations D. A technique for measuring signal strength of an amateur transmitter via the internet
T8C09 (D) Page 6-14	<p>T8C09</p> <p>How might you obtain a list of active nodes that use VoIP?</p> <ul style="list-style-type: none"> A. By subscribing to an on line service B. From on line repeater lists maintained by the local repeater frequency coordinator C. From a repeater directory D. All of these choices are correct
T8C10 (D) Page 6-15	<p>T8C10</p> <p>What must be done before you may use the EchoLink system to communicate using a repeater?</p> <ul style="list-style-type: none"> A. You must complete the required EchoLink training B. You must have purchased a license to use the EchoLink software C. You must be sponsored by a current EchoLink user D. You must register your call sign and provide proof of license

T8C11

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

- A. A gateway
- B. A repeater
- C. A digipeater
- D. A beacon

T8C11

(A)

Page 5-15

T8D — Non-voice and digital communications: image signals; digital modes; CW; packet radio; PSK31; APRS; error detection and correction; NTSC; amateur radio networking; Digital Mobile/Migration Radio

T8D01

Which of the following is a digital communications mode?

- A. Packet radio
- B. IEEE 802.11
- C. JT65
- D. All of these choices are correct

T8D01

(D)

Page 5-12

T8D02

What does the term “APRS” mean?

- A. Automatic Packet Reporting System
- B. Associated Public Radio Station
- C. Auto Planning Radio Set-up
- D. Advanced Polar Radio System

T8D02

(A)

Page 5-13

T8D03

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. The vehicle speedometer
- B. A WWV receiver
- C. A connection to a broadcast FM sub-carrier receiver
- D. A Global Positioning System receiver

T8D03

(D)

Page 5-13

T8D04

What type of transmission is indicated by the term “NTSC?”

- A. A Normal Transmission mode in Static Circuit
- B. A special mode for earth satellite uplink
- C. An analog fast scan color TV signal
- D. A frame compression scheme for TV signals

T8D04

(C)

Page 6-10

T8D05

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

- A. Providing real-time tactical digital communications in conjunction with a map showing the locations of stations
- B. Showing automatically the number of packets transmitted via PACTOR during a specific time interval
- C. Providing voice over internet connection between repeaters
- D. Providing information on the number of stations signed into a repeater

T8D05

(A)

Page 5-14

T8D06 (B) Page 5-13	<p>T8D06</p> <p>What does the abbreviation “PSK” mean?</p> <ul style="list-style-type: none"> A. Pulse Shift Keying B. Phase Shift Keying C. Packet Short Keying D. Phased Slide Keying
T8D07 (A) Page 6-15	<p>T8D07</p> <p>Which of the following best describes DMR (Digital Mobile Radio)?</p> <ul style="list-style-type: none"> A. A technique for time-multiplexing two digital voice signals on a single 12.5 kHz repeater channel B. An automatic position tracking mode for FM mobiles communicating through repeaters C. An automatic computer logging technique for hands-off logging when communicating while operating a vehicle D. A digital technique for transmitting on two repeater inputs simultaneously for automatic error correction
T8D08 (D) Page 5-13	<p>T8D08</p> <p>Which of the following may be included in packet transmissions?</p> <ul style="list-style-type: none"> A. A check sum that permits error detection B. A header that contains the call sign of the station to which the information is being sent C. Automatic repeat request in case of error D. All of these choices are correct
T8D09 (C) Page 5-11	<p>T8D09</p> <p>What code is used when sending CW in the amateur bands?</p> <ul style="list-style-type: none"> A. Baudot B. Hamming C. International Morse D. All of these choices are correct
T8D10 (D) Page 5-12	<p>T8D10</p> <p>Which of the following operating activities is supported by digital mode software in the WSJT suite?</p> <ul style="list-style-type: none"> A. Moonbounce or Earth-Moon-Earth B. Weak-signal propagation beacons C. Meteor scatter D. All of these choices are correct
T8D11 (C) Page 5-13	<p>T8D11</p> <p>What is an ARQ transmission system?</p> <ul style="list-style-type: none"> A. A special transmission format limited to video signals B. A system used to encrypt command signals to an amateur radio satellite C. A digital scheme whereby the receiving station detects errors and sends a request to the sending station to retransmit the information D. A method of compressing the data in a message so more information can be sent in a shorter time

T8D12

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

- A. An amateur-radio-based data network using commercial Wi-Fi gear with modified firmware
- B. A wide-bandwidth digital voice mode employing DRM protocols
- C. A satellite communications network using modified commercial satellite TV hardware
- D. An internet linking protocol used to network repeaters

T8D12

(A)

Page 5-12

T8D13

What is FT8?

- A. A wideband FM voice mode
- B. A digital mode capable of operating in low signal-to-noise conditions that transmits on 15-second intervals
- C. An eight channel multiplex mode for FM repeaters
- D. A digital slow scan TV mode with forward error correction and automatic color compensation

T8D13

(B)

Page 5-12

T8D14

What is an electronic keyer?

- A. A device for switching antennas from transmit to receive
- B. A device for voice activated switching from receive to transmit
- C. A device that assists in manual sending of Morse code
- D. An interlock to prevent unauthorized use of a radio

T8D14

(C)

Page 5-7

SUBELEMENT T9
Antennas and feed lines
[2 Exam Questions — 2 Groups]

T9A — Antennas: vertical and horizontal polarization; concept of gain; common portable and mobile antennas; relationships between resonant length and frequency; concept of dipole antennas

T9A01
(C)
Page 4-16

T9A01
What is a beam antenna?
A. An antenna built from aluminum I-beams
B. An omnidirectional antenna invented by Clarence Beam
C. An antenna that concentrates signals in one direction
D. An antenna that reverses the phase of received signals

T9A02
(A)
Page 4-13

T9A02
Which of the following describes a type of antenna loading?
A. Inserting an inductor in the radiating portion of the antenna to make it electrically longer
B. Inserting a resistor in the radiating portion of the antenna to make it resonant
C. Installing a spring in the base of a mobile vertical antenna to make it more flexible
D. Strengthening the radiating elements of a beam antenna to better resist wind damage

T9A03
(B)
Page 4-12

T9A03
Which of the following describes a simple dipole oriented parallel to the Earth's surface?
A. A ground-wave antenna
B. A horizontally polarized antenna
C. A rhombic antenna
D. A vertically polarized antenna

T9A04
(A)
Page 4-15

T9A04
What is a disadvantage of the "rubber duck" antenna supplied with most handheld radio transceivers when compared to a full-sized quarter-wave antenna?
A. It does not transmit or receive as effectively
B. It transmits only circularly polarized signals
C. If the rubber end cap is lost, it will unravel very easily
D. All of these choices are correct

T9A05
(C)
Page 4-13

T9A05
How would you change a dipole antenna to make it resonant on a higher frequency?
A. Lengthen it
B. Insert coils in series with radiating wires
C. Shorten it
D. Add capacitive loading to the ends of the radiating wires

T9A06
(C)
Page 4-16

T9A06
What type of antennas are the quad, Yagi, and dish?
A. Non-resonant antennas
B. Log periodic antennas
C. Directional antennas
D. Isotropic antennas

T9A07

What is a disadvantage of using a handheld VHF transceiver, with its integral antenna, inside a vehicle?

- A. Signals might not propagate well due to the shielding effect of the vehicle
- B. It might cause the transceiver to overheat
- C. The SWR might decrease, decreasing the signal strength
- D. All of these choices are correct

T9A07

(A)

Page 4-15

T9A08

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

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

T9A08

(C)

Page 4-13

T9A09

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

- A. 6
- B. 50
- C. 112
- D. 236

T9A09

(C)

Page 4-13

T9A10

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

- A. Equally in all directions
- B. Off the ends of the antenna
- C. Broadside to the antenna
- D. In the direction of the feed line

T9A10

(C)

Page 4-12

T9A11

What is the gain of an antenna?

- A. The additional power that is added to the transmitter power
- B. The additional power that is lost in the antenna when transmitting on a higher frequency
- C. The increase in signal strength in a specified direction compared to a reference antenna
- D. The increase in impedance on receive or transmit compared to a reference antenna

T9A11

(C)

Page 4-7

T9A12

What is an advantage of using a properly mounted 5/8 wavelength antenna for VHF or UHF mobile service?

- A. It has a lower radiation angle and more gain than a 1/4 wavelength antenna
- B. It has very high angle radiation for better communicating through a repeater
- C. It eliminates distortion caused by reflected signals
- D. It has 10 times the power gain of a 1/4 wavelength design

T9A12

(A)

Page 4-12

T9B — Feed lines: types, attenuation vs frequency, selecting; SWR concepts; Antenna tuners (couplers); RF Connectors: selecting, weather protection

T9B01 (B) Page 4-11	T9B01 Why is it important to have low SWR when using coaxial cable feed line? A. To reduce television interference B. To reduce signal loss C. To prolong antenna life D. All of these choices are correct
T9B02 (B) Page 4-9	T9B02 What is the impedance of most coaxial cables used in amateur radio installations? A. 8 ohms B. 50 ohms C. 600 ohms D. 12 ohms
T9B03 (A) Page 4-9	T9B03 Why is coaxial cable the most common feed line selected for amateur radio antenna systems? A. It is easy to use and requires few special installation considerations B. It has less loss than any other type of feed line C. It can handle more power than any other type of feed line D. It is less expensive than any other type of feed line
T9B04 (A) Page 4-19	T9B04 What is the major function of an antenna tuner (antenna coupler)? A. It matches the antenna system impedance to the transceiver's output impedance B. It helps a receiver automatically tune in weak stations C. It allows an antenna to be used on both transmit and receive D. It automatically selects the proper antenna for the frequency band being used
T9B05 (D) Page 4-9	T9B05 In general, what happens as the frequency of a signal passing through coaxial cable is increased? A. The characteristic impedance decreases B. The loss decreases C. The characteristic impedance increases D. The loss increases
T9B06 (B) Page 4-18	T9B06 Which of the following connectors is most suitable for frequencies above 400 MHz? A. A UHF (PL-259/SO-239) connector B. A Type N connector C. An RS-213 connector D. A DB-25 connector
T9B07 (C) Page 4-18	T9B07 Which of the following is true of PL-259 type coax connectors? A. They are preferred for microwave operation B. They are watertight C. They are commonly used at HF frequencies D. They are a bayonet type connector

T9B08

Why should coax connectors exposed to the weather be sealed against water intrusion?

- A. To prevent an increase in feed line loss
- B. To prevent interference to telephones
- C. To keep the jacket from becoming loose
- D. All of these choices are correct

T9B08

(A)

Page 4-18

T9B09

What can cause erratic changes in SWR readings?

- A. The transmitter is being modulated
- B. A loose connection in an antenna or a feed line
- C. The transmitter is being over-modulated
- D. Interference from other stations is distorting your signal

T9B09

(B)

Page 4-11

T9B10

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

- A. There is no significant difference between the two types
- B. RG-58 cable has two shields
- C. RG-8 cable has less loss at a given frequency
- D. RG-58 cable can handle higher power levels

T9B10

(C)

Page 4-17

T9B11

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

- A. 50-ohm flexible coax
- B. Multi-conductor unbalanced cable
- C. Air-insulated hard line
- D. 75-ohm flexible coax

T9B11

(C)

Page 4-9

SUBELEMENT T0

Electrical safety: AC and DC power circuits; antenna installation; RF hazards

[3 Exam Questions — 3 Groups]

T0A — Power circuits and hazards: hazardous voltages; fuses and circuit breakers; grounding; lightning protection; battery safety; electrical code compliance

T0A01
(B)
Page 9-3

T0A01

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

- A. Touching both terminals with the hands can cause electrical shock
- B. Shorting the terminals can cause burns, fire, or an explosion
- C. RF emissions from the battery
- D. All of these choices are correct

T0A02
(D)
Page 9-2

T0A02

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

- A. It may cause injury by heating tissue
- B. It may disrupt the electrical functions of cells
- C. It may cause involuntary muscle contractions
- D. All of these choices are correct

T0A03
(C)
Page 9-5

T0A03

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

- A. Neutral
- B. Hot
- C. Equipment ground
- D. The white wire

T0A04
(B)
Page 3-12

T0A04

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

- A. To prevent power supply ripple from damaging a circuit
- B. To interrupt power in case of overload
- C. To limit current to prevent shocks
- D. All of these choices are correct

T0A05
(C)
Page 3-12

T0A05

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

- A. The larger fuse would be likely to blow because it is rated for higher current
- B. The power supply ripple would greatly increase
- C. Excessive current could cause a fire
- D. All of these choices are correct

T0A06
(D)
Page 9-4

T0A06

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

- A. Use three-wire cords and plugs for all AC powered equipment
- B. Connect all AC powered station equipment to a common safety ground
- C. Use a circuit protected by a ground-fault interrupter
- D. All of these choices are correct

T0A07	Which of these precautions should be taken when installing devices for lightning protection in a coaxial cable feed line?	T0A07 (D) Page 9-5
	<ul style="list-style-type: none"> A. Include a parallel bypass switch for each protector so that it can be switched out of the circuit when running high power B. Include a series switch in the ground line of each protector to prevent RF overload from inadvertently damaging the protector C. Keep the ground wires from each protector separate and connected to station ground D. Mount all of the protectors on a metal plate that is in turn connected to an external ground rod 	
T0A08	What safety equipment should always be included in home-built equipment that is powered from 120V AC power circuits?	T0A08 (A) Page 9-5
	<ul style="list-style-type: none"> A. A fuse or circuit breaker in series with the AC hot conductor B. An AC voltmeter across the incoming power source C. An inductor in parallel with the AC power source D. A capacitor in series with the AC power source 	
T0A09	What should be done to all external ground rods or earth connections?	T0A09 (C) Page 9-5
	<ul style="list-style-type: none"> A. Waterproof them with silicone caulk or electrical tape B. Keep them as far apart as possible C. Bond them together with heavy wire or conductive strap D. Tune them for resonance on the lowest frequency of operation 	
T0A10	What can happen if a lead-acid storage battery is charged or discharged too quickly?	T0A10 (A) Page 5-19
	<ul style="list-style-type: none"> A. The battery could overheat, give off flammable gas, or explode B. The voltage can become reversed C. The memory effect will reduce the capacity of the battery D. All of these choices are correct 	
T0A11	What kind of hazard might exist in a power supply when it is turned off and disconnected?	T0A11 (D) Page 9-2
	<ul style="list-style-type: none"> A. Static electricity could damage the grounding system B. Circulating currents inside the transformer might cause damage C. The fuse might blow if you remove the cover D. You might receive an electric shock from the charge stored in large capacitors 	
T0B — Antenna safety: tower safety and grounding; erecting an antenna support; safely installing an antenna		
T0B01	When should members of a tower work team wear a hard hat and safety glasses?	T0B01 (C) Page 9-19
	<ul style="list-style-type: none"> A. At all times except when climbing the tower B. At all times except when belted firmly to the tower C. At all times when any work is being done on the tower D. Only when the tower exceeds 30 feet in height 	

T0B02 (C) Page 9-19	<p>T0B02</p> <p>What is a good precaution to observe before climbing an antenna tower?</p> <ul style="list-style-type: none"> A. Make sure that you wear a grounded wrist strap B. Remove all tower grounding connections C. Put on a carefully inspected climbing harness(fall arrester)and safety glasses D. All of these choices are correct
T0B03 (D) Page 9-20	<p>T0B03</p> <p>Under what circumstances is it safe to climb a tower without a helper or observer?</p> <ul style="list-style-type: none"> A. When no electrical work is being performed B. When no mechanical work is being performed C. When the work being done is not more than 20 feet above the ground D. Never
T0B04 (C) Page 9-18	<p>T0B04</p> <p>Which of the following is an important safety precaution to observe when putting up an antenna tower?</p> <ul style="list-style-type: none"> A. Wear a ground strap connected to your wrist at all times B. Insulate the base of the tower to avoid lightning strikes C. Look for and stay clear of any overhead electrical wires D. All of these choices are correct
T0B05 (C) Page 9-20	<p>T0B05</p> <p>What is the purpose of a gin pole?</p> <ul style="list-style-type: none"> A. To temporarily replace guy wires B. To be used in place of a safety harness C. To lift tower sections or antennas D. To provide a temporary ground
T0B06 (D) Page 9-18	<p>T0B06</p> <p>What is the minimum safe distance from a power line to allow when installing an antenna?</p> <ul style="list-style-type: none"> A. Half the width of your property B. The height of the power line above ground C. 1/2 wavelength at the operating frequency D. Enough so that if the antenna falls unexpectedly, no part of it can come closer than 10 feet to the power wires
T0B07 (C) Page 9-20	<p>T0B07</p> <p>Which of the following is an important safety rule to remember when using a crank-up tower?</p> <ul style="list-style-type: none"> A. This type of tower must never be painted B. This type of tower must never be grounded C. This type of tower must not be climbed unless retracted or mechanical safety locking devices have been installed D. All of these choices are correct
T0B08 (C) Page 9-18	<p>T0B08</p> <p>What is considered to be a proper grounding method for a tower?</p> <ul style="list-style-type: none"> A. A single four-foot ground rod, driven into the ground no more than 12 inches from the base B. A ferrite-core RF choke connected between the tower and ground C. Separate eight-foot long ground rods for each tower leg, bonded to the tower and each other D. A connection between the tower base and a cold water pipe

<p>T0B09</p> <p>Why should you avoid attaching an antenna to a utility pole?</p> <ul style="list-style-type: none"> A. The antenna will not work properly because of induced voltages B. The utility company will charge you an extra monthly fee C. The antenna could contact high-voltage power lines D. All of these choices are correct 	<p>T0B09 (C) Page 9-18</p>
<p>T0B10</p> <p>Which of the following is true when installing grounding conductors used for lightning protection?</p> <ul style="list-style-type: none"> A. Only non-insulated wire must be used B. Wires must be carefully routed with precise right-angle bends C. Sharp bends must be avoided D. Common grounds must be avoided 	<p>T0B10 (C) Page 9-5</p>
<p>T0B11</p> <p>Which of the following establishes grounding requirements for an amateur radio tower or antenna?</p> <ul style="list-style-type: none"> A. FCC Part 97 Rules B. Local electrical codes C. FAA tower lighting regulations D. UL recommended practices 	<p>T0B11 (B) Page 9-5</p>
<p>T0B12</p> <p>Which of the following is good practice when installing ground wires on a tower for lightning protection?</p> <ul style="list-style-type: none"> A. Put a loop in the ground connection to prevent water damage to the ground system B. Make sure that all bends in the ground wires are clean, right-angle bends C. Ensure that connections are short and direct D. All of these choices are correct 	<p>T0B12 (C) Page 9-5</p>
<p>T0B13</p> <p>What is the purpose of a safety wire through a turnbuckle used to tension guy lines?</p> <ul style="list-style-type: none"> A. Secure the guy if the turnbuckle breaks B. Prevent loosening of the guy line from vibration C. Prevent theft or vandalism D. Deter unauthorized climbing of the tower 	<p>T0B13 (B) Page 9-18</p>
<p>T0C — RF hazards: radiation exposure; proximity to antennas; recognized safe power levels; exposure to others; radiation types; duty cycle</p>	
<p>T0C01</p> <p>What type of radiation are VHF and UHF radio signals?</p> <ul style="list-style-type: none"> A. Gamma radiation B. Ionizing radiation C. Alpha radiation D. Non-ionizing radiation 	<p>T0C01 (D) Page 9-11</p>
<p>T0C02</p> <p>Which of the following frequencies has the lowest value for Maximum Permissible Exposure limit?</p> <ul style="list-style-type: none"> A. 3.5 MHz B. 50 MHz C. 440 MHz D. 1296 MHz 	<p>T0C02 (B) Page 9-12</p>

T0C03 (C) Page 9-14	<p>T0C03</p> <p>What is the maximum power level that an amateur radio station may use at VHF frequencies before an RF exposure evaluation is required?</p> <ul style="list-style-type: none"> A. 1500 watts PEP transmitter output B. 1 watt forward power C. 50 watts PEP at the antenna D. 50 watts PEP reflected power
T0C04 (D) Page 9-14	<p>T0C04</p> <p>What factors affect the RF exposure of people near an amateur station antenna?</p> <ul style="list-style-type: none"> A. Frequency and power level of the RF field B. Distance from the antenna to a person C. Radiation pattern of the antenna D. All of these choices are correct
T0C05 (D) Page 9-11	<p>T0C05</p> <p>Why do exposure limits vary with frequency?</p> <ul style="list-style-type: none"> A. Lower frequency RF fields have more energy than higher frequency fields B. Lower frequency RF fields do not penetrate the human body C. Higher frequency RF fields are transient in nature D. The human body absorbs more RF energy at some frequencies than at others
T0C06 (D) Page 9-14	<p>T0C06</p> <p>Which of the following is an acceptable method to determine that your station complies with FCC RF exposure regulations?</p> <ul style="list-style-type: none"> A. By calculation based on FCC OET Bulletin 65 B. By calculation based on computer modeling C. By measurement of field strength using calibrated equipment D. All of these choices are correct
T0C07 (B) Page 9-11	<p>T0C07</p> <p>What could happen if a person accidentally touched your antenna while you were transmitting?</p> <ul style="list-style-type: none"> A. Touching the antenna could cause television interference B. They might receive a painful RF burn C. They might develop radiation poisoning D. All of these choices are correct
T0C08 (A) Page 9-14	<p>T0C08</p> <p>Which of the following actions might amateur operators take to prevent exposure to RF radiation in excess of FCC-supplied limits?</p> <ul style="list-style-type: none"> A. Relocate antennas B. Relocate the transmitter C. Increase the duty cycle D. All of these choices are correct
T0C09 (B) Page 9-14	<p>T0C09</p> <p>How can you make sure your station stays in compliance with RF safety regulations?</p> <ul style="list-style-type: none"> A. By informing the FCC of any changes made in your station B. By re-evaluating the station whenever an item of equipment is changed C. By making sure your antennas have low SWR D. All of these choices are correct

T0C10

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

- A. It affects the average exposure of people to radiation
- B. It affects the peak exposure of people to radiation
- C. It takes into account the antenna feed line loss
- D. It takes into account the thermal effects of the final amplifier

T0C10

(A)

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T0C11

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

- A. The difference between the lowest power output and the highest power output of a transmitter
- B. The difference between the PEP and average power output of a transmitter
- C. The percentage of time that a transmitter is transmitting
- D. The percentage of time that a transmitter is not transmitting

T0C11

(C)

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T0C12

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

- A. RF radiation does not have sufficient energy to cause genetic damage
- B. RF radiation can only be detected with an RF dosimeter
- C. RF radiation is limited in range to a few feet
- D. RF radiation is perfectly safe

T0C12

(A)

Page 9-11

T0C13

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?

- A. 3 times as much
- B. 1/2 as much
- C. 2 times as much
- D. There is no adjustment allowed for shorter exposure times

T0C13

(C)

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