2025 Canadian Amateur Radio Basic Exam

This document contains the entire **July 15, 2025** Canadian Amateur Radio Exam Question Bank with only the **CORRECT** answer listed. This is the best way to study for the exam.

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Section 1 - Regulations and Policies

B-001-001-001 Which document assigns the authority to make Canadian regulations governing radiocommunications? **The Radiocommunication Act**

B-001-001-002 Which document assigns the authority to publish Standards for the Operation of Radio Stations in the Amateur Radio Service in Canada? **The Radiocommunication Act**

B-001-001-003 Which department is responsible for the administration of the Radiocommunication Act? **Innovation, Science and Economic Development Canada**

B-001-001-004 Which document defines the Canadian "amateur radio service"? **The Radiocommunication Regulations**

B-001-002-001 What must you do within 30 days of a mailing address change? **Inform Innovation, Science and Economic Development Canada**

B-001-002-002 An Amateur Radio Operator Certificate is valid for: **life**

B-001-002-003 Whenever a change of address is made: **you must notify Innovation, Science and Economic Development Canada within 30 days of a change of mailing address**

B-001-002-004 The Amateur Radio Operator Certificate: **must be retained at the station**

B-001-002-005 A radio inspector asks to see your Amateur Radio Operator Certificate, or a copy thereof. Per the regulations, how many hours are you given to comply? **48**

B-001-002-006 What is the fee for a first Amateur Radio Operator Certificate? **Free**

B-001-002-007 The Amateur Radio Operator Certificate should be: **retained at the address provided to Innovation, Science and Economic Development Canada**

B-001-002-008 What is the fee to issue a replacement call sign with a new prefix, due to a change in address to a new province or territory? **Free**

B-001-002-009 What is the fee for changing an existing call sign (including changing to a two-letter call sign)? **$60**

B-001-003-001 Transmissions outside of amateur radio bands: **are prohibited and penalties could be assessed to the control operator**

B-001-003-002 What is the term in the regulations that defines if an amateur radio operator falsely transmits the word "MAYDAY" when there isn't an emergency? **A false or fraudulent message**

B-001-003-003 Transmitting a false or fraudulent distress signal or message is prohibited. The person found guilty is liable to what penalty? **A fine, not exceeding $5 000, or a prison term not exceeding one year, or both**

B-001-003-004 Which government document states the offences and penalties relating to radiocommunications? **The Radiocommunication Act**

B-001-003-005 Which of the following is NOT correct? The Minister of Innovation, Science and Industry may suspend an Amateur Radio Operator Certificate: **with no notice, or opportunity to make representations thereto**

B-001-003-006 Which of the following statements is NOT correct? **A radio inspector may enter a dwelling without the consent of the occupant and without a warrant**

B-001-003-007 When is an amateur radio operator permitted to transmit false information? **Transmitting false information is never permitted**

B-001-003-008 Interfering with, or obstructing any radio communication, without lawful cause, is prohibited. The person found guilty is liable to what penalty? **A fine, not exceeding $5 000, or a prison term not exceeding one year, or both**

B-001-004-001 How old must you be to hold an Amateur Radio Operator Certificate with Basic Qualification? **There are no age limits**

B-001-004-002 Which examination must be passed before an Amateur Radio Operator Certificate is issued? **Basic Qualification**

B-001-004-003 Holders of which one of the following certificates may be issued an Amateur Radio Operator Certificate? **Canadian Radiocommunication Operator General Certificate Maritime (RGMC)**

B-001-004-004 After an Amateur Radio Operator Certificate with Basic Qualification is issued, the holder may be examined for additional qualifications in the following order: **any order**

B-001-004-005 What sending and receiving speed, in words per minute (wpm), must you achieve to be granted the Morse code Qualification? **5 wpm**

B-001-004-006 You hold an Amateur Radio Operator Certificate with Advanced Qualification. Besides the amateur radio service, in what other service does this authorization allow you to operate a station? **No other service**

B-001-004-007 What conditions must candidates for amateur radio certification meet? **Have a valid address in Canada**

B-001-005-001 Under what circumstances can an amateur radio operator with an Advanced Qualification install, place in operation, modify or repair radio apparatus on behalf of another person? **If the other person holds an authorization for this apparatus**

B-001-005-002 Under what circumstances can an amateur radio operator reprogram a land mobile transmitter on behalf of another person for use on 2 metres? **Only if the other person holds an Amateur Radio Operator Certificate**

B-001-005-003 What regulatory requirement must be met to allow you to install an amateur radio transmitter on behalf of another person? **Both you and the other person must hold Amateur Radio Operator Certificates**

B-001-005-004 An amateur radio operator with Basic and Morse code qualifications may install an amateur radio station for another person: **only if the other person is the holder of a valid Amateur Radio Operator Certificate**

B-001-005-005 What regulatory requirement must be met to allow you to repair an amateur radio transmitter on behalf of another person? **Both you and the other person must hold Amateur Radio Operator Certificates**

B-001-005-006 What regulatory requirement must be met to allow you to place an amateur radio transmitter in service on behalf of another person? **Both you and the other person must hold Amateur Radio Operator Certificates**

B-001-006-001 An amateur radio station with a maximum power output of 2 watts: **must be under the supervision of a person holding an Amateur Radio Operator Certificate and call sign**

B-001-006-002 An amateur radio station may be used to communicate with: **stations operated under similar authorizations**

B-001-006-003 Under what circumstances is an amateur radio operator permitted to use an amplifier to amplify the output of a licence-exempt transmitter? **This is not permitted**

B-001-006-004 When is it permissible to use amateur radio equipment, with or without modification, to transmit outside amateur radio bands? **Never, amateur radio equipment is not certified for operation outside amateur radio bands**

B-001-006-005 Which of the following statements is NOT correct? A person may operate radio apparatus, authorized in the amateur radio service: **on aeronautical, marine or land mobile frequencies**

B-001-006-006 Some VHF and UHF FM radios purchased for use in the amateur radio service can also be programmed to communicate on frequencies used for the land mobile service. Under what conditions is this permissible? **The radio is certified and licensed for use in the land mobile service**

B-001-007-001 Which of the following topics is prohibited on an amateur radio club net? **Business planning**

B-001-007-002 When is an amateur radio operator allowed to broadcast information to the general public? **An amateur radio operator may never broadcast to the general public**

B-001-007-003 Which of the following statements is NOT correct? **An amateur radio operator may conduct occasional business on the air**

B-001-007-004 Which of the following one-way communications may NOT be transmitted in the amateur radio service? **Broadcasts intended for the general public**

B-001-007-005 Under what condition are you permitted to use a new digital encoding technique that you developed to transmit data over amateur radio bands? **When it is published in the public domain**

B-001-007-006 When may an amateur radio station transmit an encoded message? **Only when the encoding or cipher is not secret**

B-001-007-007 What are the restrictions on the use of abbreviations or procedural signals in the amateur radio service? **They may be used if the signals or codes are not secret**

B-001-007-008 What should you do to keep your amateur radio station from retransmitting music or signals from a non-amateur radio station? **Turn down the volume of background audio**

B-001-007-009 The transmission of a secret code by the operator of an amateur radio station: **is not permitted**

B-001-007-010 An amateur radio operator may be engaged in communications including the transmission of: **Q codes**

B-001-007-011 In the amateur radio service, business communications: **are not permitted under any circumstance**

B-001-008-001 Where may holders of an Amateur Radio Operator Certificate operate an amateur radio station in Canada? **Anywhere in Canada**

B-001-008-002 Which type of station may transmit one-way communications? **Beacon station**

B-001-008-003 What minimum qualifications must an amateur radio operator hold to assemble commercially available transmitter kits of professional design? **Basic**

B-001-008-004 What minimum qualifications must an amateur radio operator hold to install a repeater operating on a single band in a voice mode? **Basic and Advanced**

B-001-008-005 What minimum qualifications must an amateur radio operator hold to install an amateur radio club station? **Basic and Advanced**

B-001-008-006 What minimum qualifications must an amateur radio operator hold to install or operate a transmitter or RF amplifier that is neither professionally designed nor commercially manufactured for use in the amateur radio service? **Basic and Advanced**

B-001-008-007 What minimum qualifications must an amateur radio operator hold to operate cross-band repeaters? **Basic**

B-001-008-008 What minimum qualifications must an amateur radio operator hold to remotely operate a transmitter, including changing frequency, emission mode or output power? **Basic and Advanced**

B-001-009-001 Who is responsible for the operation of an amateur radio station? **Both the control operator and the station owner**

B-001-009-002 If you transmit from another amateur radio station, who is responsible for its operation? **Both of you**

B-001-009-003 What is your responsibility as a station owner? **You are responsible for the operation of the station in accordance with the regulations**

B-001-009-004 Who may be the control operator of an amateur radio station? **Any qualified amateur radio operator chosen by the station owner**

B-001-009-005 When must an amateur radio station have a control operator? **Whenever the station is transmitting**

B-001-009-006 When an amateur radio station is transmitting, where must its control operator be? **At the station's control point**

B-001-009-007 Why can't family members without qualifications transmit using your amateur radio station if they are alone with your equipment? **They must hold suitable amateur radio qualifications before they are allowed to be control operators**

B-001-009-008 The owner of an amateur radio station may: **permit any person to operate the station under the supervision and in the presence of the holder of an Amateur Radio Operator Certificate**

B-001-009-009 Under what circumstances can a person who does NOT have an Amateur Radio Operator Certificate operate an amateur radio station? **When the person is under supervision, and in the presence of, a person holding appropriate qualifications**

B-001-010-001 What is a transmission that disturbs other communications called? **Harmful interference**

B-001-010-002 When may you deliberately interfere with another amateur radio station's communications? **Deliberate interference is never acceptable**

B-001-010-003 If the regulations say that the amateur radio service is a secondary user of a frequency band, and another service is a primary user, what does this mean? **Amateur radio operators are allowed to use the frequency band only if they do not cause interference to primary users**

B-001-010-004 What rule applies if two amateur radio operators want to use the same frequency? **Both station operators have an equal right to operate on the frequency**

B-001-010-005 What name is given to a form of interference that seriously degrades, obstructs or repeatedly interrupts a radiocommunication service? **Harmful interference**

B-001-010-006 In the event the Minister of Innovation, Science and Industry determines that an amateur radio station causes harmful interference, what are the Minister's powers? **Order the station's operation to cease or change**

B-001-010-007 Amateur radio operation must not cause interference to other radio services operating in which of the following bands? **430.0 MHz to 450.0 MHz**

B-001-010-008 Amateur radio operations are NOT protected from interference caused by another service operating in which of the following frequency bands? **902 MHz to 928 MHz**

B-001-010-009 Under what circumstances may the operator of an amateur radio station conduct test transmissions? **When the transmission will not cause interference to stations in the amateur radio service or other services**

B-001-010-010 Which of these amateur radio bands may be heavily occupied by licence-exempt devices? **902 MHz to 928 MHz**

B-001-011-001 Amateur radio stations may communicate: **only with other amateur radio stations**

B-001-011-002 During relief operations in the days following a disaster, when may you use your amateur radio equipment to communicate on frequencies outside amateur radio bands? **Using frequencies outside amateur radio bands is never permitted**

B-001-011-003 If you hear an unanswered distress signal on an amateur radio band where you do NOT have privileges to communicate: **you may respond and offer assistance**

B-001-011-004 In the amateur radio service, it is permissible to broadcast: **radio communications required for the safety of life and property**

B-001-011-005 An amateur radio operator in distress may: **use any means of radiocommunication**

B-001-011-006 During a disaster, when may an amateur radio station make transmissions necessary to meet essential communication needs and assist relief operations? **When normal communication systems are overloaded, damaged or disrupted**

B-001-011-007 What transmitter power limitations must be observed by an amateur radio operator in distress? **No limitations**

B-001-011-008 What is expected of operators NOT directly involved in a disaster relief net? **Avoid needless transmissions on or near the net frequency**

B-001-011-009 When may amateur radio operators handle messages from recognized public service agencies? **During peace time, civil emergencies and exercises**

B-001-011-010 When are you permitted to interfere with another station's transmissions? **When your station is directly involved with a distress situation**

B-001-012-001 What kind of payment is allowed for third-party messages sent by an amateur radio station? **No payment of any kind is allowed**

B-001-012-002 Radiocommunications transmitted by stations other than a broadcasting station may be divulged or used: **if it is transmitted by an amateur radio station**

B-001-012-003 When may an amateur radio operator demand or accept remuneration for exchanging messages? **Never, it is expressly prohibited**

B-001-012-004 With regard to divulging the content of radiocommunications other than broadcasting, which of the following is an offence? **Where it is for the purpose of answering questions from a media organization**

B-001-013-001 Which of the following call signs is a valid Canadian amateur radio call sign? **VA3RAC**

B-001-013-002 How often must an amateur radio station be identified? **At least every thirty minutes, and at the beginning and at the end of a contact**

B-001-013-003 What do you transmit to identify your amateur radio station? **Your call sign**

B-001-013-004 What identification, if any, is required when two amateur radio stations begin communications? **Each station must transmit its own call sign**

B-001-013-005 What identification, if any, is required when two amateur radio stations end communications? **Each station must transmit its own call sign**

B-001-013-006 What is the longest period of time an amateur radio station can transmit, without identifying by call sign? **30 minutes**

B-001-013-007 When may an amateur radio operator transmit unidentified communications? **Only to control a model craft**

B-001-013-008 What language may you use when identifying your station? **English or French**

B-001-013-009 The call sign of an amateur radio station must be transmitted: **at the beginning and at the end of each contact and at intervals not greater than 30 minutes**

B-001-013-010 What are the station identification requirements for a test transmission? **The rules are the same for a test or a radio contact**

B-001-013-011 The call sign of a Canadian amateur radio station would normally start with the letters: **VA, VE, VO or VY**

B-001-014-001 If a friend without amateur radio certification is using your station to talk to someone in Canada, and a foreign station breaks in to talk to your friend, what should you do? **Continue monitoring the communications of your friend**

B-001-014-002 In what circumstances can foreign amateur radio operators, other than United States citizens, operate while visiting Canada? **Their country has an agreement with Canada and the amateur radio operator has obtained the appropriate permit**

B-001-014-003 Canadian amateur radio operators may use their stations to transmit international communications on behalf of a third party: **because Canada does not prohibit international communications on behalf of third parties**

B-001-014-004 What condition would preclude a Canadian amateur radio station from communicating with amateur radio stations in another country? **The country has filed an objection to such communications with the International Telecommunication Union (ITU)**

B-001-014-005 Foreign amateur radio operators may operate in Canada if they qualify for a CEPT (European Conference of Postal and Telecommunications Administrations) Amateur Radio Licence. What operating privileges are they granted by Innovation, Science and Economic Development Canada? **Advanced**

B-001-014-006 Third-party communications are those conducted on behalf of a person without amateur radio certification. In the Canadian amateur radio service, what third-party communications are permissible? **Only communications of a personal and non-commercial nature**

B-001-014-007 International third-party amateur radio communication in case of emergencies or disaster relief is expressly permitted unless: **specifically prohibited by the foreign administration concerned**

B-001-014-008 You and a foreign amateur radio operator both have a local friend without amateur radio certification engaged in radio communication. Who is considered a third party? **Both non-certified persons**

B-001-014-009 While operating in Canada, what information must the holder of a United States-issued call sign indicate at least once during a contact? **Location by city and province**

B-001-014-010 While in Canada and operating in a voice mode, American amateur radio operators must identify with their call sign, the qualifier "mobile" or "portable" and what other information? **The Canadian call sign prefix for the geographic location of the station**

B-001-014-011 Canadian amateur radio stations may provide communications on behalf of third parties: **with any other amateur radio station**

B-001-015-001 If you let another amateur radio operator with additional qualifications than yours control your station and operate under your call sign, what operating privileges are allowed? **Only the privileges allowed by your qualifications**

B-001-015-002 If you are the control operator at the station of another amateur radio operator who has more certificate qualifications than you, what operating privileges are you allowed? **Only the privileges allowed by your qualifications**

B-001-015-003 In addition to passing the Basic written examination, what must you do before you are allowed to use amateur radio frequencies below 30 MHz? **You must attain a mark of 80% on the Basic examination, or pass an Advanced or Morse code examination**

B-001-015-004 The holder of an Amateur Radio Operator Certificate may operate radio-controlled models: **on all amateur radio bands above 30 MHz**

B-001-015-005 What is the frequency range of the 80-metre amateur radio band in Canada? **3.5 MHz to 4.0 MHz**

B-001-015-006 What is the frequency range of the 160-metre amateur radio band in Canada? **1.8 MHz to 2.0 MHz**

B-001-015-007 What is the frequency range of the 40-metre amateur radio band in Canada? **7.0 MHz to 7.3 MHz**

B-001-015-008 What is the frequency range of the 20-metre amateur radio band in Canada? **14.000 MHz to 14.350 MHz**

B-001-015-009 What is the frequency range of the 15-metre amateur radio band in Canada? **21.000 MHz to 21.450 MHz**

B-001-015-010 What is the frequency range of the 10-metre amateur radio band in Canada? **28.000 MHz to 29.700 MHz**

B-001-015-011 In Canada, which bands may amateur radio operators use for radio control of models? **All amateur radio bands above 30 MHz**

B-001-016-001 What is the maximum authorized bandwidth on the 6-metre and 2-metre bands? **30 kHz**

B-001-016-002 The maximum bandwidth of an amateur radio station's transmission allowed in the band 28 MHz to 29.7 MHz is: **20 kHz**

B-001-016-003 Except for one band, what is the allowed bandwidth on amateur radio bands between 7 MHz and 25 MHz? **6 kHz**

B-001-016-004 The maximum bandwidth of an amateur radio station's transmission allowed in the band 144 MHz to 148 MHz is: **30 kHz**

B-001-016-005 The maximum bandwidth of an amateur radio station's transmission allowed in the band 50 MHz to 54 MHz is: **30 kHz**

B-001-016-006 Which of the following amateur radio bands has a maximum allowed bandwidth of less than 6 kHz? **10.100 MHz to 10.150 MHz**

B-001-016-007 In which of the following amateur radio bands is single sideband prohibited? **10.100 MHz to 10.150 MHz**

B-001-016-008 What precaution must an amateur radio operator take when transmitting near band edges? **Ensure that the entire occupied bandwidth falls within the amateur radio band**

B-001-016-009 Based on the frequency stated and emission mode, which of the following combinations is prohibited? **Fast-scan television (ATV) on 145 MHz**

B-001-016-010 Based on the frequency stated and emission mode, which of the following combinations is prohibited? **Fast-scan television (ATV) on 14.23 MHz**

B-001-016-011 Based on the frequency stated and emission mode, which of the following combinations is prohibited? **Single sideband (SSB) on 10.12 MHz**

B-001-017-001 What transmitter power should Canadian amateur radio operators use at all times? **The minimum legal power necessary to communicate**

B-001-017-002 For single sideband (SSB) operation, what is the maximum transmitter peak envelope power (PEP) that an amateur radio station may use if the operator holds an Amateur Radio Operator Certificate with Advanced Qualification? **2250 watts**

B-001-017-003 You have determined the maximum transmitter power that meets RF exposure and radiated power limits. Where do you verify this power is NOT exceeded? **At the output of the transmitter or external amplifier**

B-001-017-004 For SSB operation on 3750 kHz, what is the maximum transmitter peak envelope power (PEP) that an amateur radio station may use if the operator holds an Amateur Radio Operator Certificate with Basic and Morse code qualifications? **560 watts**

B-001-017-005 For SSB operation on 7055 kHz, what is the maximum transmitter peak envelope power (PEP) that an amateur radio station may use if the operator holds an Amateur Radio Operator Certificate with Basic Qualification with Honours? **560 watts**

B-001-017-006 What is the maximum effective radiated power (ERP), expressed as peak envelope power (PEP), the holder of an Amateur Radio Operator Certificate with Advanced Qualification may use on 60 metres? **100 watts**

B-001-017-007 What is the maximum allowed DC input power to the final RF stage of an amateur radio transmitter when the operator holds an Amateur Radio Operator Certificate with Advanced Qualification? **1000 watts**

B-001-017-008 On 630 metres and 2200 metres, what key antenna characteristic must be taken into account to comply with power limitations expressed as equivalent isotropically radiated power (EIRP)? **Gain**

B-001-017-009 What maximum DC input power to the transmitter final amplifier stage, may be used by the holder of an Amateur Radio Operator Certificate with Basic Qualification? **250 watts**

B-001-017-010 Unless an operator holds an Amateur Radio Operator Certificate with Advanced Qualification, what is the maximum carrier power that an amateur radio station may use on emissions other than SSB? **190 watts**

B-001-018-001 What kind of amateur radio station automatically retransmits the signals of other stations? **Repeater station**

B-001-018-002 An unmodulated carrier may be transmitted only: **for brief tests on frequencies below 30 MHz**

B-001-018-003 What is the lowest output frequency of the repeaters that holders of an Amateur Radio Operator Certificate with only a Basic Qualification are allowed to use? **29.500 MHz**

B-001-018-004 What is the lowest output frequency band segment of the repeaters that holders of an Amateur Radio Operator Certificate with only a Basic Qualification are allowed to use? **29.500 MHz to 29.700 MHz**

B-001-019-001 What do Canadian regulations stipulate regarding frequency stability in the amateur radio service? **It must be equivalent to crystal control below 148 MHz**

B-001-019-002 Which of the following emission modes requires that an amateur radio station have means to prevent or indicate overmodulation? **SSB**

B-001-019-003 Amateur radio stations are required to have means of indicating or preventing a signal quality problem unique to voice transmissions. What is it? **Overmodulation**

B-001-019-004 What is the maximum percentage of modulation permitted for amateur radio voice communications? **100%**

B-001-019-005 What must all amateur radio stations be capable of reliably measuring, regardless of emission mode? **Frequency**

B-001-019-006 What is the maximum percentage of modulation permitted for amateur radio voice communications? **100%**

B-001-020-001 What types of messages may be transmitted to an amateur radio station in a foreign country? **Messages related to the purposes of amateur radio or remarks of a personal nature**

B-001-020-002 The amateur radio station operator shall ensure that: **international communications are limited to the purposes of amateur radio or remarks of a personal nature**

B-001-020-003 Which of the following is a provision of the International Telecommunication Union's Radio Regulations that applies to Canadian amateur radio operators? **International communications are permitted unless an administration has registered an objection**

B-001-020-004 What do the International Telecommunication Union's Radio Regulations prescribe regarding proficiency in Morse code? **Administrations determine if proficiency in Morse code is a requirement for authorization**

B-001-020-005 Canadian amateur radio operators must comply with the Radiocommunication Act and Radiocommunication Regulations. What other organization issues radio regulations that Canadian amateur radio operators must comply with? **International Telecommunication Union**

B-001-021-001 In which region of the International Telecommunication Union is Canada located? **Region 2**

B-001-021-002 A Canadian amateur radio operator, operating their station in the state of Florida, is subject to which frequency band limits? **Those applicable to United States amateur radio operators**

B-001-021-003 A Canadian amateur radio operator, operating their station 7 kilometres offshore from the coast of Florida, is subject to which frequency band limits? **Those applicable to United States amateur radio operators**

B-001-021-004 In which region of the International Telecommunication Union are Australia, Japan, and Southeast Asia located? **Region 3**

B-001-021-005 In which region of the International Telecommunication Union are Europe and Africa located? **Region 1**

B-001-021-006 A CEPT (European Conference of Postal and Telecommunications Administrations) Amateur Radio Licence allows a qualified Canadian amateur radio operator to operate while visiting any participating country. What minimum level of qualification does a Canadian amateur radio operator need? **Advanced**

B-001-021-007 A Canadian amateur radio operator with a CEPT (European Conference of Postal and Telecommunications Administrations) Amateur Radio Licence operates in a participating country using a voice mode. What form of identifica-

tion is required? **Transmit the visited country's prefix, followed by "stroke," followed by their Canadian call sign**

B-001-021-008 What minimum level of qualification does a Canadian amateur radio operator need to operate in the United States? **Basic**

B-001-021-009 A Canadian amateur radio operator is operating in the United States using voice. What form of identification is required? **Transmit their Canadian call sign, followed by "portable" or "mobile" as appropriate, followed by the prefix for the US call area being visited**

B-001-022-001 Which of these statements is NOT correct? **The fee for taking an examination for an Amateur Radio Operator Certificate at an Innovation, Science and Economic Development Canada office is $5 per qualification**

B-001-022-002 Which of the following statements is NOT correct? **A disabled candidate may be exempted from portions of an Amateur Radio Operator Certificate examination**

B-001-022-003 What is the fee for taking an examination for an Amateur Radio Operator Certificate, administered by an accredited examiner? **The examiner may charge a fee to recover costs**

B-001-022-004 What is the fee for taking Amateur Radio Operator Certificate examinations at an Innovation, Science and Economic Development Canada office? **No charge for qualification examinations**

B-001-022-005 Which of the following statements is NOT correct? **A candidate with insufficient knowledge of English or French may be accompanied by an interpreter**

B-001-023-001 Which of these statements about the installation or modification of an antenna structure is NOT correct? **An amateur radio operator may erect any size antenna structure without consulting neighbours or the local land-use authority**

B-001-023-002 Who has authority over antenna installations, including antenna masts and towers? **The Minister of Innovation, Science and Industry**

B-001-023-003 When may you NOT be required to contact land-use authorities to determine public consultation requirements for an antenna system? **When an exclusion criterion defined by Innovation, Science and Economic Development Canada applies**

B-001-023-004 If an amateur radio operator wants to install or modify an antenna system and the local land-use authority has no approval process, what must the amateur radio operator do? **Follow the default public consultation process outlined by Innovation, Science and Economic Development Canada**

B-001-023-005 Which is NOT an element of the Innovation, Science and Economic Development Canada public consultation process for antenna systems? **Participating in public meetings on the project**

B-001-023-006 Innovation, Science and Economic Development Canada's default public consultation process for antenna systems requires proponents to address: **reasonable and relevant concerns provided in writing within the 30-day public comment period**

B-001-023-007 In a municipality with a public consultation process for antenna systems, when might public consultation NOT be required? **The system is excluded by the municipal process OR the provisions of Client Procedures Circular CPC-2-0-03**

B-001-023-008 The proponent of an antenna system and a stakeholder, other than the general public, have failed to reach an agreement. How is a final decision reached? **The decision is made by Innovation, Science and Economic Development Canada**

B-001-023-009 Ignoring other requirements regarding the installation or modification of an antenna system, what is the tallest antenna structure you could erect without public consultation? **The tallest exempted by the land-use authority or Innovation, Science and Economic Development Canada**

B-001-023-010 Where a land-use authority or municipality has established a public consultation process for antenna systems, who determines how public consultation should take place? **The municipality or local land-use authority**

B-001-024-001 What organization has published safety guidelines for the maximum limits of RF energy near the human body? **Health Canada**

B-001-024-002 What is the purpose of Safety Code 6? **It gives RF exposure limits for the human body**

B-001-024-003 According to Safety Code 6, what frequencies cause us the greatest risk from RF energy? **48 MHz to 300 MHz**

B-001-024-004 Why is the limit of exposure to RF the lowest in the frequency range of 48 MHz to 300 MHz, according to Safety Code 6? **The human body absorbs RF energy the most in this range**

B-001-024-005 According to Safety Code 6, what is the maximum safe power output to the antenna of a hand-held VHF or UHF radio? **Not specified**

B-001-024-006 When specifying maximum levels of exposure to RF fields, which two basic situations does Safety Code 6 cover? **Controlled and uncontrolled environments**

B-001-024-007 Apart from energy absorption and especially below 10 MHz, what is the second established adverse health effect described in Safety Code 6? **Nerve stimulation**

B-001-024-008 Which statement is NOT correct? **Hand-held transmitters are excluded from Safety Code 6 requirements**

B-001-024-009 Safety Code 6 sets limits for RF exposure from radio transmitters. Which types of transmitters are exempt from regulation? **No transmitters are exempt**

B-001-024-010 Which of these statements about Safety Code 6 is NOT correct? **Safety Code 6 sets limits in terms of power levels fed into antennas**

B-001-025-001 Your neighbour's stereo system malfunctions when you are transmitting. What provision in Electromagnetic Compatibility Advisory Bulletin EMCAB-2 deems the stereo system's lack of immunity is the cause? **The field strength of your emissions, on your neighbour's premises, is below Innovation, Science and Economic Development Canada's specified immunity criteria**

B-001-025-002 Your neighbour's television receiver malfunctions when you are transmitting. What provision in Electromagnetic Compatibility Advisory Bulletin EMCAB-2 deems your transmission is the cause? **The field strength of your emissions, on your neighbour's premises, is above Innovation, Science and Economic Development Canada's specified immunity criteria**

B-001-025-003 When determining the field strength criterion per Electromagnetic Compatibility Advisory Bulletin EMCAB-2, what type of equipment describes devices often used in home entertainment systems, but not strictly speaking radio apparatus? **Associated equipment**

B-001-025-004 Your neighbour complains that your transmissions interfere with their garage door opener. When determining the applicable field strength criterion in Electromagnetic Compatibility Advisory Bulletin EMCAB-2, what type of equipment is the garage door opener? **Radio-sensitive equipment**

Section 2 - Operating and Procedures

B-002-001-001 What is an appropriate way to make contact on a repeater? **Say the call sign of the station you want to contact, then your call sign**

B-002-001-002 What is the main purpose of a repeater? **To increase the range of portable and mobile stations**

B-002-001-003 What is frequency coordination on VHF and UHF bands? **A process which seeks to carefully recommend frequencies to minimize interference with neighbouring repeaters**

B-002-001-004 What is the purpose of a repeater time-out timer? **It interrupts lengthy transmissions**

B-002-001-005 What is a CTCSS tone? **A sub-audible tone that activates a receiver audio output when present**

B-002-001-006 How do you call another station on a repeater if you know the station's call sign? **Say the station's call sign, then identify your own station**

B-002-001-007 Why should you pause before and between transmissions when using a repeater? **To listen for anyone else wanting to use the repeater**

B-002-001-008 Why should you keep transmissions short when using a repeater? **A long transmission may prevent someone with an emergency from using the repeater**

B-002-001-009 What is the proper way to join a conversation on a repeater? **Say your call sign during a break between transmissions**

B-002-001-010 What is the accepted way to ask someone about their location when using a repeater? **Where are you?**

B-002-001-011 FM repeater operation on the 2-metre band uses one frequency for transmission and one for reception. What is the standard difference between the transmit and receive frequencies (known as "offset")? **600 kHz**

B-002-002-001 To make your call sign better understood when using voice transmissions, what should you do? **Use International Telecommunication Union phonetic alphabet code words to spell letters in your call sign**

B-002-002-002 What can you use as an aid for correct station identification when using voice? **The International Telecommunication Union phonetic alphabet**

B-002-002-003 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter A? **Alfa**

B-002-002-004 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter B? **Bravo**

B-002-002-005 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter D? **Delta**

B-002-002-006 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter E? **Echo**

B-002-002-007 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter G? **Golf**

B-002-002-008 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter I? **India**

B-002-002-009 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter L? **Lima**

B-002-002-010 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter P? **Papa**

B-002-002-011 In the International Telecommunication Union phonetic alphabet, what is the code word for the letter R? **Romeo**

B-002-003-001 What is the correct way to call "CQ" when using voice? **Say "CQ" three times, followed by "this is," followed by your call sign spoken three times**

B-002-003-002 How should you answer a voice CQ call? **Say the other station's call sign once, followed by "this is," then your call sign**

B-002-003-003 What is simplex operation? **Transmitting and receiving on the same frequency**

B-002-003-004 When should you consider using simplex operation instead of a repeater? **When signals are reliable between communicating parties without using a repeater**

B-002-003-005 Why should local communications use VHF and UHF frequencies instead of HF frequencies? **To minimize clutter on HF bands more appropriate for long-distance communication**

B-002-003-006 Why should you be careful in choosing a simplex frequency when operating VHF or UHF? **To avoid inadvertently choosing a frequency that is the input to a local repeater**

B-002-003-007 If you are talking to a station using a repeater, how would you find out if you could communicate using simplex instead? **By checking if you can clearly receive the station on the repeater's input frequency**

B-002-003-008 If you are operating simplex on a repeater frequency, why would it be good practice to change to another frequency? **Because you may interfere with users of the repeater**

B-002-003-009 Which sideband is commonly used for 20-metre voice operation? **Upper**

B-002-003-010 Which sideband is commonly used on 3755 kHz for voice operation? **Lower**

B-002-003-011 When calling a specific station on voice, what is the preferred format for your transmission? **The call sign of the desired station, followed by "this is" and your call sign**

B-002-004-001 What should you do before you transmit on any frequency? **Listen to make sure others are not using the frequency**

B-002-004-002 If you contact another station and your signal is extremely strong and perfectly readable, what adjustment should you make to your transmitter? **Turn down your power output to the minimum necessary**

B-002-004-003 You need to transmit to adjust your antenna tuner prior to joining an HF single-sideband net that is in progress. On what frequency should you make the adjustment? **3 kHz to 5 kHz away from the net frequency**

B-002-004-004 How can on-the-air interference be minimized during lengthy transmitter testing? **Use a dummy load**

B-002-004-005 Why would you use a dummy load? **To test or adjust your transceiver without causing interference**

B-002-004-006 If you are the net control station of a daily HF net, what should you do if the frequency on which you normally meet is in use just before the net begins? **Ask occupants if they would change frequency, otherwise move to a clear frequency**

B-002-004-007 If a net is about to begin on a frequency that you and another station are using, what should you do? **As a courtesy, move to a different frequency**

B-002-004-008 If propagation changes during your contact and you notice increasing interference from other stations on the same frequency, what should you do? **Move to another frequency**

B-002-004-009 When selecting a single-sideband voice transmitting frequency, what minimum frequency separation from a contact in progress should you allow to minimize interference? **Approximately 3 kHz**

B-002-004-010 What is a band plan? **A voluntary division of an amateur radio band to avoid interference between incompatible modes**

B-002-004-011 Before transmitting, the first thing you should do is: **listen carefully so as not to interrupt communications already in progress**

B-002-005-001 What is the correct way to call "CQ" when using Morse code? **Send the letters "CQ" three times, followed by the word "DE," followed by your call sign three times**

B-002-005-002 How should you answer a routine Morse code "CQ" call? **Send the other station's call sign twice, followed by the word "DE," followed by your call sign twice**

B-002-005-003 At what speed should a Morse code "CQ" call be transmitted? **At any speed which you can reliably receive**

B-002-005-004 What is the meaning of "CQ"? **Calling any station**

B-002-005-005 What is the meaning of the word "DE" in Morse code? **From**

B-002-005-006 What is the meaning of the Morse code signal "K"? **Any station please reply**

B-002-005-007 What is meant by the term "DX"? **Distant station**

B-002-005-008 What is the meaning of the term "73"? **Best regards**

B-002-005-009 Which of the following describes full break-in CW (QSK)? **Incoming signals are received between transmitted dots and dashes**

B-002-005-010 When selecting a CW transmitting frequency, what minimum frequency separation from a contact in progress should you allow to minimize interference? **150 Hz to 500 Hz**

B-002-005-011 What is the meaning of the Morse code signal "R"? **All received**

B-002-006-001 What do "RST" signal reports describe? **Signal reception**

B-002-006-002 What does "RST" stand for in a signal report? **Readability, signal strength, tone**

B-002-006-003 What is the meaning of: "Your signal report is 5 7"? **Your signal is perfectly readable and moderately strong**

B-002-006-004 What is the meaning of: "Your signal report is 3 3"? **Your signal is readable with considerable difficulty and weak in strength**

B-002-006-005 What is the meaning of: "You are 5 9 plus 20 dB"? **You are perfectly readable with a signal strength 20 decibels greater than S9**

B-002-006-006 A distant station asks for a signal report on a local repeater you monitor. What do you report? **The quality of the station's signal and audio as heard through the repeater**

B-002-006-007 Your receiver's S-meter is calibrated to a standard of 6 dB per S-unit per a recommendation by the International Amateur Radio Union (IARU). The S-meter shows S9 when receiving a station transmitting with 100 watts. Neglecting

propagation changes, what transmitter power would cause your receiver's S-meter to read S8? **25 watts**

B-002-006-008 Assume your receiver's S-meter is calibrated to a standard of 6 dB per S-unit per a recommendation by the International Amateur Radio Union (IARU). The S-meter on your receiver shows S8 when listening to a nearby transmitter. Approximately how much must the transmitter power be raised to increase the reading to S9? **4 times**

B-002-006-009 What does "RST 579" mean in a Morse code contact? **Your signal is perfectly readable, moderately strong, and with perfect tone**

B-002-006-010 What does "RST 459" mean in a Morse code contact? **Your signal is quite readable, fair strength, and with perfect tone**

B-002-006-011 In voice contacts, what is the meaning of "Your signal report is 1 1"? **Your signal is unreadable, and barely perceptible**

B-002-007-001 What does the code "QRS" mean in amateur radio? **Send more slowly**

B-002-007-002 What does the code "QTH" mean in amateur radio? **My location is . . .**

B-002-007-003 What is the proper Q code to use to see if a frequency is in use before transmitting on CW? **QRL?**

B-002-007-004 What does the code "QSY" mean in amateur radio? **Change frequency**

B-002-007-005 What does the code "QSB" mean in amateur radio? **Your signal is fading**

B-002-007-006 What is the correct Q code to ask who is calling you? **QRZ?**

B-002-007-007 What does the code "QRM" mean in amateur radio? **I am being interfered with**

B-002-007-008 What does the code "QRN" mean in amateur radio? **I am troubled by static**

B-002-007-009 What is the Q code indicating that you want the other station to send slower? **QRS**

B-002-007-010 What is the Q code that means "Who is calling me?" in amateur radio? **QRZ?**

B-002-007-011 What is the Q code that means "I will call you again" in amateur radio? **QRX**

B-002-008-001 When may you use your amateur radio station to transmit an "SOS" or "MAYDAY"? **In a life-threatening distress situation**

B-002-008-002 You need to summon help while stranded in a remote location, but without immediate risk to life. What priority is your message? **Urgent**

B-002-008-003 What voice signal, transmitted three times, signifies distress? **MAYDAY**

B-002-008-004 What is the correct distress signal in Morse code? **SOS**

B-002-008-005 What is the correct way to interrupt a repeater conversation to seek assistance in a distress situation? **Break-in between transmissions to state your call sign and situation**

B-002-008-006 What is the advantage of preparing to operate your station without commercial AC power? **So you may provide communications during a power outage**

B-002-008-007 In an emergency, what additional equipment is crucial to maintaining communications with a hand-held radio? **An adequate supply of charged batteries**

B-002-008-008 Which type of antenna would be a good choice as part of a portable HF station that could be set up in case of an emergency? **A dipole or a vertical**

B-002-008-009 If you are communicating with another station and hear a station in distress break in, what should you do? **Acknowledge the station in distress and determine its location and what assistance may be needed**

B-002-008-010 In order of priority, a distress message comes before: **an emergency message**

B-002-008-011 If you hear distress traffic and are unable to render direct assistance you should: **contact authorities and maintain watch in case your assistance is needed**

B-002-009-001 What is a "QSL card"? **A written proof of communication between two amateur radio operators**

B-002-009-002 What is an azimuthal map? **A map projection centred on a given location**

B-002-009-003 While making a contact in a VHF contest, the other operator asks for your grid square. What information is requested? **Your location expressed as a 4 or 6-character code**

B-002-009-004 A directional antenna pointed in the long-path direction to another station is generally oriented how many degrees from its short-path heading? **180 degrees**

B-002-009-005 What method is used by amateur radio operators to provide proof of communication with another station? **A QSL card or entries in web-based logging systems**

B-002-009-006 Local stations are in contact with New Zealand, yet you cannot hear the New Zealand amateur radio operators with your antenna pointed in that direction. What other antenna direction could you try to hear them? **Point your antenna 180 degrees from the current bearing**

B-002-009-007 Which statement about recording all contacts and unanswered CQ calls in a paper or computer-based station logbook is NOT correct? **A logbook is a regulatory requirement**

B-002-009-008 What is the most useful function of an azimuthal world map centred on your location? **To show the bearing to any location**

B-002-009-009 Activity schedules, time entries in logbooks and contact confirmations usually refer to UTC (Coordinated Universal Time). What is the location of the meridian from which this time is measured? **Greenwich, United Kingdom**

B-002-009-010 Your time zone is UTC minus 6 hours. You want to join a net scheduled for 19:00 UTC. What is the local scheduled time? **1 PM**

B-002-009-011 What is the usefulness of stations CHU, WWV and WWVH to amateur radio operators? **Provide accurate and precise frequency and time signals**

Section 3 - Station Assembly, Practice and Safety

B-003-001-001 To be most effective, where should a low-pass filter be connected in an HF station without an external power amplifier? **As close as possible to the transceiver output**

B-003-001-002 In an HF station that includes an external RF power amplifier, where should a low-pass filter be located? **As close as possible to the external amplifier output**

B-003-001-003 Why do modern HF transmitters have a built-in low-pass filter in their RF output circuits? **To reduce harmonic emissions**

B-003-001-004 Which component in an HF station is used to determine if the antenna system impedance is matched to the transmitter? **SWR meter**

B-003-001-005 What is the purpose of the antenna switch in an HF station? **To select the desired antenna or dummy load**

B-003-001-006 In an HF station, what device might allow the use of an antenna on a band it was not designed for? **An antenna tuner**

B-003-001-007 In an HF station, which component is designed to dissipate RF energy and prevent radiation? **Dummy load**

B-003-001-008 In an HF station, right after which component is the SWR meter inserted? **The low-pass filter**

B-003-001-009 When using an HF transmitter with a solid-state final amplifier, which station component may need to be adjusted when changing frequency? **Antenna tuner**

B-003-002-001 What does the microphone produce in an FM transmitter? **An electrical signal driving the speech amplifier**

B-003-002-002 The microphone of an FM transmitter: **produces an electrical signal from air pressure changes**

B-003-002-003 An FM transmitter's modulator: **affects the frequency of the oscillator**

B-003-002-004 How is the oscillator in the FM transmitter different from oscillators in AM, CW, and SSB transmitters? **The modulator alters its frequency**

B-003-002-005 In an FM transmitter, the frequency multiplier: **produces the FM output carrier frequency**

B-003-002-006 In an FM transmitter, which stage produces a useful harmonic? **Frequency multiplier**

B-003-002-007 In an FM transmitter, which stage draws the most electric power? **Power amplifier**

B-003-003-001 In a superheterodyne receiver, which stage is called the front-end? **RF amplifier**

B-003-003-002 In a VHF superheterodyne receiver, which stage must be designed to produce very little noise? **RF amplifier**

B-003-003-003 In a superheterodyne receiver, which stage allows detection to function at a single frequency regardless of the received frequency? **Mixer**

B-003-003-004 In a superheterodyne receiver, which stage sets the received frequency? **Local oscillator**

B-003-003-005 In a superheterodyne receiver, which stage rejects signals on adjacent channels? **IF filter**

B-003-003-006 In a superheterodyne receiver, which stage provides the final signal power to drive the detector? **IF amplifier**

B-003-003-007 In an FM receiver, what is the purpose of the limiter? **Remove amplitude variations from the received signal**

B-003-003-008 In an FM receiver, what is the purpose of the discriminator? **Recover the original modulation from the carrier**

B-003-003-009 In a receiver, which stage is controlled by the volume control? **AF amplifier**

B-003-003-010 In an FM receiver, which stage includes a squelch circuit? **AF amplifier**

B-003-004-001 In a basic CW transmitter, the output from the oscillator is: **at the transmitted signal's frequency**

B-003-004-002 In a basic CW transmitter, what type of electricity directly powers each stage? **Direct current**

B-003-004-003 In a basic CW transmitter, why is the oscillator followed by a driver/buffer stage? **To prevent load changes from shifting the oscillator's frequency**

B-003-004-004 In a basic three-stage CW transmitter, what does the key do? **It controls the amplitude of the carrier**

B-003-004-005 In a basic CW transmitter, what does the power amplifier stage do? **It increases the transmitter's output power**

B-003-004-006 In a basic CW transmitter, what does the key do? **It switches the carrier on and off**

B-003-005-001 In an SSB/CW receiver, what is the purpose of the antenna? **Convert electromagnetic waves into electrical currents**

B-003-005-002 In an SSB/CW receiver, what is the purpose of the radio frequency (RF) amplifier? **Increase the sensitivity of the receiver**

B-003-005-003 In an SSB/CW receiver, what is the purpose of the mixer? **Convert the received signal into the intermediate frequency**

B-003-005-004 In an SSB/CW receiver, what is the purpose of the signal generated by the local oscillator? **It is mixed with the incoming signal to produce the intermediate frequency**

B-003-005-005 In an SSB/CW receiver, what is the purpose of the intermediate frequency (IF) filter? **Provide most of the selectivity of the receiver**

B-003-005-006 In an SSB/CW receiver, what is the purpose of the intermediate frequency (IF) amplifier? **Provide most of the receiver gain**

B-003-005-007 In an SSB/CW receiver, what is the purpose of the product detector? **Recover the transmitted modulation**

B-003-005-008 In an SSB/CW receiver, what is the purpose of the signal produced by the beat frequency oscillator (BFO)? **It is mixed with the IF to recover the transmitted modulation**

B-003-005-009 In an SSB/CW receiver, what is the purpose of the audio frequency (AF) amplifier? **Increase the level of the recovered modulation**

B-003-005-010 In an SSB/CW receiver, which stage could include an audio band-pass filter? **AF amplifier**

B-003-006-001 In a single-sideband transmitter, what does the fixed RF oscillator do? **It produces an RF carrier**

B-003-006-002 In a single-sideband transmitter, why is the speech amplifier needed? **Microphones usually have a low power output**

B-003-006-003 In a typical single-sideband transmitter, what is the purpose of the filter that follows the balanced modulator? **Remove the unwanted sideband**

B-003-006-004 In a typical single-sideband transmitter, at what frequency is the sideband filter tuned? **Near the fixed RF oscillator frequency**

B-003-006-005 In a single-sideband transmitter, what is the purpose of the speech amplifier? **Amplify the audio you wish to transmit**

B-003-006-006 In a single-sideband transmitter, which stage transposes the single-sideband signal to the operating frequency? **Mixer**

B-003-006-007 In a single-sideband transmitter, which stage allows you to adjust the final transmit frequency? **Variable frequency oscillator**

B-003-006-008 In a single-sideband transmitter, which stage normally includes a circuit providing protection from excessive SWR? **Final amplifier**

B-003-006-009 In a single-sideband transmitter, which stage transposes the voice message from the audio spectrum to the radio spectrum? **Balanced modulator**

B-003-007-001 Which of the following is a function of the sound card interface in a station operating computer-based digital modes? **To convert the received analog audio signal from the transceiver into a digital signal for the computer**

B-003-007-002 Which of the following is a function of the sound card interface in a station operating computer-based digital modes? **To convert the digital signal from the computer into an audio signal that can be transmitted**

B-003-007-003 Which of the following is one function of most sound card interfaces in a station operating computer-based digital modes? **Switch the transceiver between receive and transmit modes**

B-003-007-004 Which of the following is a function of the sound card interface in a station operating computer-based digital modes? **To provide audio frequency coupling between a computer and a transceiver**

B-003-007-005 Why are isolation transformers often included in the sound card interface of a station operating computer-based digital modes? **To prevent the coupling of the transceiver and computer from introducing hum and interference into the transmitted signals**

B-003-007-006 Why are some transceivers capable of operating computer-based digital modes without a separate sound card? **Because they incorporate an audio codec**

B-003-008-001 If a linear power supply provides overvoltage protection, where is the voltage monitored? **At the output of the regulator**

B-003-008-002 What is the purpose of the transformer in a linear power supply? **Convert the AC mains voltage up or down as required and provide isolation**

B-003-008-003 What is the purpose of the rectifier in a linear power supply? **Convert alternating current into direct current**

B-003-008-004 What is the purpose of the filter in a linear power supply? **Smooth out pulsating direct current**

B-003-008-005 What is the purpose of the regulator in a linear power supply? **Ensure that the voltage stays constant when the demand on the supply varies**

B-003-008-006 In a linear power supply, which stage typically requires a heat sink? **Voltage regulator**

B-003-009-001 Which component of a 3-element Yagi antenna is primarily for mechanical support? **The boom**

B-003-009-002 In a 3-element Yagi antenna, what is the longest radiating element? **The reflector**

B-003-009-003 In a 3-element Yagi antenna, which is the shortest radiating element? **The director**

B-003-009-004 In a 3-element Yagi antenna, which element is connected to the transmission line? **The driven element**

B-003-010-001 Which series of emission modes listed below is in order from the narrowest bandwidth to the widest bandwidth? **CW, SSB voice and FM voice**

B-003-010-002 The figure in a receiver's specifications which indicates its sensitivity is the: **RF input signal needed to achieve a given signal-to-noise ratio**

B-003-010-003 What are the two signal parameters presented to the user on the waterfall display (spectrogram) of a modern receiver? **Amplitude and frequency**

B-003-010-004 What is the function of automatic gain control (AGC) in a receiver? **Limit the change in volume due to large signal strength variations**

B-003-010-005 For which of the following emission modes is it important for the receiver to be tuned accurately (within 100 Hz)? **SSB**

B-003-010-006 A superheterodyne receiver has an intermediate frequency (IF) of 455 kHz. The local oscillator runs above the operating frequency. To which frequency should it be tuned to receive a signal on 3.54 MHz? **3.995 MHz**

B-003-010-007 When receiving a modulated signal, what is the adverse consequence of too narrow a receiver bandwidth? **Loss of information**

B-003-010-008 Apart from sensitivity and selectivity, which of these is the third main indicator of communications receiver performance? **Dynamic range**

B-003-010-009 A communications receiver has four filters installed in it, respectively designated as 250 Hz, 500 Hz, 2.4 kHz, and 6 kHz. If you were listening to single sideband, which filter would you utilize? **2.4 kHz**

B-003-010-010 A communications receiver has four filters installed in it, respectively designated as 250 Hz, 500 Hz, 2.4 kHz and 6 kHz. You are copying a CW transmission and there is a great deal of interference. Which one of the filters would you choose? **250 Hz**

B-003-010-011 When receiving CW, which of these frequency ranges is optimum for a band-pass filter? **750 Hz to 850 Hz**

B-003-011-001 What does chirp mean? **A small change in the output frequency of a transmitter each time a dit or dah is sent**

B-003-011-002 What can be done to keep a CW transmitter from chirping? **Keep the power supply voltages very steady under varying loads**

B-003-011-003 What is the advantage of using a variable frequency oscillator in a basic CW transmitter? **Frequency is not constrained to the available crystals**

B-003-011-004 Which type of transmitter modulation changes the amplitude of an RF wave for the purpose of conveying information? **Amplitude modulation**

B-003-011-005 In what emission mode does the instantaneous amplitude (envelope) of the RF signal vary with the modulating audio? **Amplitude modulation**

B-003-011-006 Morse code is usually transmitted by radio as: **an interrupted carrier**

B-003-011-007 You are transmitting using amplitude modulation. What bandwidth does your signal occupy if the highest frequency of your voice is 3 kHz? **6 kHz**

B-003-011-008 What frequency components are present in the bandwidth of an amplitude modulated signal? **Carrier and two sidebands**

B-003-011-009 An RF oscillator should be electrically and mechanically stable. This is to ensure that the oscillator does NOT: **drift in frequency over time**

B-003-011-010 The DC power to the final stage of your transmitter is 200 watts and the RF output is 125 watts. What has happened to the rest of the power? **It has been dissipated as heat**

B-003-011-011 The difference between DC input power and RF output power of a transmitter RF amplifier: **appears as heat**

B-003-012-001 What may happen if an SSB transmitter is operated with the microphone gain set too high? **It may interfere with other stations operating near its frequency**

B-003-012-002 What may happen if an SSB transmitter is operated with too much speech processing? **It may cause audio distortion or splatter interference to other stations operating near its frequency**

B-003-012-003 What is the term for the average power during one RF cycle, at the crest of the modulation envelope? **Peak envelope power**

B-003-012-004 What is the usual bandwidth of an amateur radio single-sideband signal? **Between 2 kHz and 3 kHz**

B-003-012-005 Why does the power amplifier of the SSB transmitter need to be linear? **Voice is unintelligible when amplified by a non-linear amplifier**

B-003-012-006 What is one advantage of carrier suppression in a double sideband voice transmission? **More of the output power can be put into the sidebands**

B-003-012-007 What does overmodulation do to a single-sideband signal? **It becomes distorted and occupies more bandwidth**

B-003-012-008 How should the microphone gain control be adjusted for voice operation on a single-sideband transmitter? **Such that the maximum range on the ALC meter is never exceeded on voice peaks**

B-003-012-009 The purpose of a balanced modulator in an SSB transmitter is to: **suppress the carrier and pass the two sidebands**

B-003-012-010 Your SSB transmitter is set to operate lower sideband at 7100 kHz. With a single 1000 Hz tone as modulation, at which frequency is RF transmitted? **7099 kHz**

B-003-012-011 The automatic level control (ALC) in an SSB transmitter: **limits the input audio peaks so that the transmitter is not overdriven**

B-003-013-001 What causes the loud noise heard from an FM receiver in the absence of a signal? **The very large gain of stages ahead of the discriminator**

B-003-013-002 You are using an FM repeater configured for 5 kHz deviation, but your transmitter is set to 2.5 kHz deviation. What is the consequence? **Your audio will be low**

B-003-013-003 What term defines the change in frequency caused by modulation in an FM transmitter? **Deviation**

B-003-013-004 What kind of emission would your FM transmitter produce if its microphone failed to work? **An unmodulated carrier**

B-003-013-005 Why is FM voice best for local VHF/UHF radio communications? **It provides a good signal-to-noise ratio at low RF signal levels**

B-003-013-006 What is the approximate bandwidth of a frequency modulated signal using 5 kHz deviation? **Between 10 kHz and 20 kHz**

B-003-013-007 How is a higher level of the modulating signal represented in an FM signal? **By a larger deviation of the carrier frequency**

B-003-013-008 What modulation method is most closely related to frequency modulation? **Phase modulation**

B-003-013-009 Why isn't FM used as an amateur radio emission mode below 28 MHz? **The bandwidth would exceed limits in the regulations**

B-003-013-010 Several stations report that your FM transmission is loud and distorted, but on frequency. Which of the following is the most probable cause of the distortion? **Speaking too loudly into the microphone**

B-003-013-011 When more than one signal is present, the FM receiver is likely to demodulate only the strongest signal. What is this behaviour called? **Capture effect**

B-003-014-001 What do many amateur radio operators use to help form good Morse code characters? **Electronic keyer**

B-003-014-002 How does an electronic keyer help form good Morse code characters? **By regulating the lengths of the dits and dahs**

B-003-014-003 What do you need to adjust before using a microphone for the first time with a transceiver? **Microphone gain level**

B-003-014-004 What noise management system analyzes noise and signal characteristics to partially remove noise? **DSP noise reduction**

B-003-014-005 What circuit causes a transmitter to automatically transmit when an operator speaks into its microphone? **VOX**

B-003-014-006 What is the reason for using a properly adjusted speech processor with a single-sideband voice transmitter? **It improves the intelligibility of your signal**

B-003-014-007 If a single-sideband voice transmitter is 100% modulated, how will using a speech processor affect the transmitter's output? **Increase the average power**

B-003-014-008 In a receiver, what noise management circuit recognizes high-amplitude short-duration pulses and removes them? **Noise blanker**

B-003-014-009 What type of interference is a noise blanker circuit most effective in eliminating? **Short-duration impulse-type noise**

B-003-014-010 What is the function of transmit/receive switching in a transceiver? **To enable one antenna to be used for both transmitting and receiving**

B-003-014-011 What type of microphone has internal components similar to a loudspeaker? **Dynamic**

B-003-015-001 Why can a modern digital radio system transmit voice and images, not just data? **Any analog information can be converted to digital data**

B-003-015-002 What is the fundamental difference between digital and analog data? **Digital data is encoded as discrete pre-agreed values**

B-003-015-003 What is the function of a digipeater? **To receive digital data and retransmit data marked for retransmission**

B-003-015-004 What does "network" mean in packet radio? **A way of connecting packet-radio stations so data can be sent over long distances**

B-003-015-005 Why can dozens of FT8 communications occur simultaneously in the space needed for one single-sideband transmission? **Narrow bandwidth of an FT8 signal**

B-003-015-006 Which of these modes can work at the lowest signal-to-noise ratio as measured in a 2500 Hz bandwidth? **FT8**

B-003-015-007 When selecting an RTTY transmitting frequency, what minimum frequency separation from a contact in progress should you allow (centre to centre) to minimize interference? **250 Hz to 500 Hz**

B-003-015-008 When using a digital mode based on a computer sound card, how can you verify that the transmit audio level is NOT excessive? **Ask a local station to confirm your signal is free of splatter**

B-003-015-009 What feature of packet radio makes it especially useful for emergency communications? **Reliable messaging (guaranteed delivery or notification of failure)**

B-003-015-010 A digital protocol implements automatic repeat request (ARQ). What does it permit? **Error correction**

B-003-015-011 With a digital communication mode based on a computer sound card, what is the result of feeding excessive audio into the transmitter? **Splatter or out-of-channel emissions**

B-003-016-001 What approximate voltage does a standard automobile starter battery usually supply? **12 volts**

B-003-016-002 Which of the following has a positive terminal and a negative terminal? **A battery**

B-003-016-003 A battery, that can be repeatedly recharged by supplying it with electrical energy, is known as a: **storage battery**

B-003-016-004 Which of the following is a source of electromotive force (EMF)? **Lithium-ion battery**

B-003-016-005 Why is the NiMH battery often preferred over a conventional alkaline battery? **It can be repeatedly recharged**

B-003-016-006 The voltage at a battery's terminals will drop when it supplies current. What is the cause of the drop? **Internal resistance**

B-003-016-007 For portable operation, what is the primary advantage of lithium-based batteries over lead-acid batteries? **High battery capacity per kilogram**

B-003-016-008 Battery capacity is commonly stated as a value of current delivered over a specified period of time. What is the effect of exceeding that specified current? **The battery will discharge more rapidly than specified**

B-003-016-009 What voltage and capacity will you achieve by connecting two 12 volts, 20 ampere-hour batteries in parallel? **12 volts, 40 ampere-hours**

B-003-016-010 What voltage and capacity will you achieve by connecting two 12 volts, 20 ampere-hour batteries in series? **24 volts, 20 ampere-hours**

B-003-016-011 A lithium-ion battery should never be: **short-circuited**

B-003-017-001 You construct a simple DC power supply using a transformer, rectifier and filter capacitor. If you use the supply to power a CW transmitter, what problem with signal quality could it cause? **Chirp**

B-003-017-002 What device converts 120 volts AC to 12 volts DC? **Power supply**

B-003-017-003 When selecting a 13.8 V DC power supply for a transceiver, what design specification is most important? **Output current capability**

B-003-017-004 Compared to a switching (switch mode) power supply, why may a linear power supply be preferred? **Lower risk of radio frequency noise**

B-003-017-005 In a mobile installation, why should the fuse in the DC line to the transceiver be located as near to the battery as possible? **To protect the entire circuit**

B-003-017-006 Apart from efficiency, what is one advantage of a switching (switch mode) power supply over a linear power supply? **Reduced physical dimensions and weight**

B-003-017-007 Why are heavy-gauge wires used for a 100-watt transceiver's DC power connection? **To minimize the voltage drop**

B-003-017-008 What are the nominal power-line voltages supplied to homes? **120 volts and 240 volts**

B-003-017-009 Your transceiver's user guide suggests limiting the voltage drop to 0.5 volts and the vehicle battery is 3 metres away. Given the losses listed below at the required current of 22 amperes, which minimum wire gauge must you use? **Number 10, 0.07 V per metre**

B-003-017-010 Why must the positive lead from the vehicle battery to your transceiver be fused? **To prevent an overcurrent situation from starting a fire**

B-003-017-011 You have a very loud low-frequency hum appearing on your transmission. In what part of the transmitter would you first look for the trouble? **The power supply**

B-003-018-001 How could you best keep unauthorized persons from using your station at home? **Use a key-operated on/off switch in the main power line**

B-003-018-002 How could you best keep unauthorized persons from using a mobile station in your car? **Remove the microphone when you are not using it**

B-003-018-003 What electrical hazard, if any, does the starter battery in a vehicle present? **High short-circuit current**

B-003-018-004 Why would there be a switch in a high-voltage power supply to turn off the power if its cabinet is opened? **To keep anyone opening the cabinet from getting shocked by dangerous high voltages**

B-003-018-005 What is the minimum electrical current that can be fatal to the human body? **20 milliamperes**

B-003-018-006 Which body organ can be fatally affected by a very small amount of electrical current? **The heart**

B-003-018-007 What is the lowest voltage that is usually considered hazardous to humans? **30**

B-003-018-008 What should you do if you discover someone who is being burned by high voltage? **Turn off the power, call for emergency help and provide first aid if needed**

B-003-018-009 What is the safest method to remove an unconscious person from contact with a high-voltage source? **De-energize the power source before touching the person**

B-003-018-010 Before checking a fault in a mains-operated power supply unit, it would be safest to first: **turn off the power and unplug the power cord**

B-003-018-011 What is the risk involved in troubleshooting a live power supply? **Electric shock**

B-003-019-001 For best protection from electrical shock, what should be grounded in your station? **All station equipment**

B-003-019-002 Established practice demands that all ground electrodes be bonded together with heavy conductors. What protection does this provide in case of a lightning strike? **Prevents voltage differences between devices**

B-003-019-003 Why should you never use a fuse with a higher current rating than specified? **A fault may cause permanent damage, including a fire**

B-003-019-004 Which of these materials is best for a ground rod driven into the earth? **Copper-clad steel**

B-003-019-005 You need to work on a power supply that has been taken offline. What is the first thing you should do once the cabinet is open? **Discharge the filter capacitors**

B-003-019-006 Where should the green wire in a three-wire AC line cord be connected in a power supply? **To the chassis**

B-003-019-007 Your third-floor station has a ground wire running 10 metres down to a ground rod. You get an RF burn when you touch your HF transceiver while transmitting. What is the likely cause? **The ground wire has high impedance on your operating frequency**

B-003-019-008 Where should the chassis ground terminals on all station equipment be connected? **To the station's single-point ground**

B-003-019-009 What is a safe method to discharge power supply filter capacitors? **Use an insulated shorting stick with an inline resistor**

B-003-019-010 On mains-operated power supplies, the ground wire of the AC line is connected to the power supply chassis. What protection does this provide if a fault occurs in the power supply? **Ensures the chassis does not become energized**

B-003-019-011 Why do fuses have a voltage rating? **To specify the voltage that can be interrupted without arcing**

B-003-020-001 Why should you ground all antenna and rotator cables when your station is not in use? **To help protect the station equipment and building from lightning damage**

B-003-020-002 You want to install a lightning surge protector on your transmission line, where should it be inserted? **Outside, as close to earth grounding as possible**

B-003-020-003 How can your station equipment best be protected from lightning damage? **Disconnect all equipment from the power lines and antenna cables**

B-003-020-004 What equipment should be worn for working on an antenna tower? **Approved fall arrest equipment**

B-003-020-005 Why should you wear approved fall arrest equipment if you are working on an antenna tower? **To limit injuries if you fall**

B-003-020-006 For safety, how high should you place a horizontal wire antenna? **High enough so that no one can touch any part of it from the ground**

B-003-020-007 Why should you wear a hard hat if you are on the ground helping someone work on an antenna tower? **To protect your head from something dropped from the tower**

B-003-020-008 Why should your outside antennas be high enough so that no one can touch them while you are transmitting? **Touching the antenna might cause RF burns**

B-003-020-009 Why should you make sure that no one can touch an open-wire transmission line while you are transmitting with it? **Because high-voltage radio energy might burn the person**

B-003-020-010 What safety precautions should you take before beginning repairs on an antenna? **Be sure to turn off the transmitter and disconnect the transmission line**

B-003-020-011 What safety precaution is especially important for a ground-mounted antenna? **Ensure people are kept at a safe distance**

B-003-021-001 What should you do for safety when operating at UHF and microwave frequencies? **Keep antenna away from your eyes when RF is applied**

B-003-021-002 What should you do for safety if you put up a UHF transmitting antenna? **Make sure the antenna will be in a place where no one can get near it when you are transmitting**

B-003-021-003 What should you do for safety, before removing the shielding on a UHF power amplifier? **Make sure the amplifier cannot accidentally be turned on**

B-003-021-004 Why should you make sure the antenna of a hand-held transceiver is not close to your head when transmitting? **To reduce your exposure to the radio frequency energy**

B-003-021-005 How should you position the antenna of a hand-held transceiver while you are transmitting? **Away from your head and away from others**

B-003-021-006 How can exposure to a large amount of RF energy affect body tissue? **It heats the tissue**

B-003-021-007 Which body organ is the most likely to be damaged from the heating effects of RF radiation? **Eyes**

B-003-021-008 How does the power density of an electromagnetic wave change as it propagates away from an antenna in free space? **It decreases as the square of the distance**

B-003-021-009 If you operate your station with indoor antennas, what precautions should you take when you install them? **Locate the antennas as far away as possible from living spaces that will be occupied while you are operating**

B-003-021-010 Why should directional high-gain antennas be mounted higher than nearby structures? **So they will not direct RF energy toward people in nearby structures**

B-003-021-011 For best RF safety, where should the ends and centre of a dipole antenna be located? **As high as possible to prevent people from coming in contact with the antenna**

Section 4 - Circuit Components

B-004-001-001 What term describes a circuit designed to increase the amplitude of a signal? **Amplifier**

B-004-001-002 If an amplifier becomes non-linear, the output signal would: **become distorted**

B-004-001-003 To increase the level of very weak radio signals from an antenna, you would use: **an RF amplifier**

B-004-001-004 To increase the level of very weak signals from a microphone you would use: **an audio amplifier**

B-004-001-005 What range of frequencies does the speech amplifier of an amateur radio transceiver typically process? **300 Hz to 3 000 Hz**

B-004-001-006 Apart from power and current, which signal property can amplifiers be specifically designed to increase? **Voltage**

B-004-001-007 The increase in signal level by an amplifier is called: **gain**

B-004-001-008 A device with gain has the property of: **amplification**

B-004-001-009 A device labelled “Gain = 10 dB” is likely to be an: **amplifier**

B-004-001-010 What term describes the ratio of output power to DC input power of an amplifier? **Efficiency**

B-004-001-011 What is the result of excessive positive feedback in an amplifier stage? **Oscillations appear**

B-004-002-001 A diode is in series in the positive power lead to a transceiver. What is its purpose? **Reverse polarity protection**

B-004-002-002 One important application for diodes is recovering information from transmitted signals. This is referred to as: **detection**

B-004-002-003 The primary purpose of a Zener diode is to: **regulate or maintain a constant voltage**

B-004-002-004 The action of changing alternating current to direct current is called: **rectification**

B-004-002-005 The electrodes of a semiconductor diode are known as: **anode and cathode**

B-004-002-006 If alternating current is applied to the anode of a diode, what would you expect to see at the cathode? **Pulsating direct current**

B-004-002-007 In a semiconductor diode, electrons flow from: **cathode to anode**

B-004-002-008 What semiconductor device glows different colours, depending upon its chemical composition? **A light-emitting diode**

B-004-002-009 Which property of a semiconductor diode permits its use for reverse-polarity protection? **It conducts in one direction only**

B-004-002-010 In order for a diode to conduct, it must be: **forward biased**

B-004-003-001 Which of these components can amplify a small signal using low voltages? **Bipolar transistor**

B-004-003-002 What term describes the most basic semiconductor component used to amplify? **Transistor**

B-004-003-003 What are the three electrodes of a bipolar transistor? **Collector, emitter and base**

B-004-003-004 If a low-level signal is placed at the input to a transistor and a higher level of the signal is produced at the output, what is this effect called? **Amplification**

B-004-003-005 What prevents the substitution of a PNP transistor with an NPN transistor? **The polarities are reversed**

B-004-003-006 A semiconductor device is labelled as a “general purpose audio NPN device.” What is it? **Bipolar transistor**

B-004-003-007 What are the two basic types of bipolar transistors? **NPN and PNP**

B-004-003-008 Which of these operating conditions is most likely to cause a transistor to fail? **Excessive heat**

B-004-003-009 Which electrode of the bipolar transistor controls the output current? **Base**

B-004-003-010 When a bipolar transistor is used as a switch, which electrode controls its state? **Base**

B-004-003-011 If a transistor is alternatively driven into saturation and cut-off, what does it behave like? **A switch**

B-004-004-001 When considering the material between source and drain, what are two basic types of field-effect transistors (FET)? **N channel and P channel**

B-004-004-002 Which semiconductor device has a gate, a drain and a source? **Field-effect transistor**

B-004-004-003 In a field-effect transistor, which electrode controls the resistance of the device’s channel? **Gate**

B-004-004-004 In a field-effect transistor, from which electrode do charge carriers enter the channel? **Source**

B-004-004-005 In a field-effect transistor, from which electrode do charge carriers leave the channel? **Drain**

B-004-004-006 Why is a field-effect transistor considered a high impedance device? **The gate never conducts current**

B-004-004-007 What is the control electrode in a field-effect transistor? **Gate**

B-004-004-008 In a field-effect transistor, what circuit parameter change causes the current to increase? **The reverse bias is decreased**

B-004-004-009 Which electrode of a bipolar transistor corresponds to the source of a field-effect transistor? **Emitter**

B-004-004-010 Which electrode of a bipolar transistor corresponds to the drain of a field-effect transistor? **Collector**

B-004-004-011 In a field-effect transistor, which two electrodes are connected to the ends of the channel? **Source and drain**

B-004-005-001 What is one reason a triode vacuum tube might be used instead of a transistor in a circuit? **It may be able to handle higher power**

B-004-005-002 Which two elements of a triode carry the output current? **Cathode and plate**

B-004-005-003 A feature common to triode tubes and transistors is that both: **can amplify signals**

B-004-005-004 Which electrode on a vacuum tube is operated with the highest positive voltage? **Plate**

B-004-005-005 Which semiconductor device has characteristics most similar to a triode vacuum tube? **Field-effect transistor**

B-004-005-006 Which electrode of a vacuum triode is the control element? **Grid**

B-004-005-007 In a vacuum tube, which electrode emits electrons? **Cathode**

B-004-005-008 What is inside the envelope of a triode tube? **A vacuum**

B-004-005-009 What term describes a vacuum tube with a cathode, a single grid and a plate? **Triode**

B-004-006-001 On resistors with four colour bands, which colour band specifies the tolerance? **Fourth**

B-004-006-002 On a resistor with four colour bands, what do the first three colour bands indicate? **The value of the resistor in ohms**

B-004-006-003 On a resistor with four colour bands, what does the fourth colour band indicate? **The resistance tolerance in percent**

B-004-006-004 What are the possible values of a 100-ohm resistor with a 10% tolerance? **90 ohms to 110 ohms**

B-004-006-005 On resistors with four colour bands, which colour band differentiates two resistors rated at 33 ohms and 39 ohms respectively? **Second**

B-004-006-006 Out of the list of resistor tolerances below, which has the highest precision? **0.1%**

B-004-006-007 Out of the list of resistor tolerances below, which has the lowest precision? **20%**

B-004-006-008 How does the resistance of a resistor change with rising ambient temperature? **It depends on its temperature coefficient**

B-004-006-009 Which resistor rating is specified as a given fraction per degree Celsius? **Temperature coefficient**

B-004-006-010 On resistors with four colour bands, which colour band differentiates two resistors rated at 120 ohms and 1200 ohms respectively? **Third**

B-004-006-011 Given that red=2, violet=7 and yellow=4, what is the nominal value of a resistor whose colour code reads “red,” “violet” and “yellow”? **270 kilohms**

Section 5 - Basic Electronics and Theory

B-005-001-001 If a dial marked in megahertz shows a reading of 3.525 MHz, what would it show if it were marked in kilohertz? **3 525 kHz**

B-005-001-002 If an ammeter marked in amperes is used to measure a 3000-milliampere current, what reading would it show? **3 amperes**

B-005-001-003 How many hertz is 1 kHz? **1 000 Hz**

B-005-001-004 How many microfarads is 1 000 000 picofarads? **1 microfarad**

B-005-001-005 If you have a hand-held transceiver that puts out 500 milliwatts, how many watts would this be? **0.5 watts**

B-005-001-006 A kilohm is: **1000 ohms**

B-005-001-007 How many megahertz is 7040 kHz? **7.040 MHz**

B-005-001-008 A current of one quarter ampere may be written as: **250 milliamperes**

B-005-001-009 How many millivolts equal two volts? **2 000 mV**

B-005-001-010 How can a frequency in megahertz be stated in gigahertz? **Divide by 1 000**

B-005-001-011 How many millihenries equal 10 000 microhenries? **10 millihenries**

B-005-002-001 Which of these groups lists three good electrical conductors? **Gold, silver and aluminum**

B-005-002-002 Which of these groups lists three good electrical insulators? **Glass, air and porcelain**

B-005-002-003 What do we call the flow of electric charge in a circuit? **Current**

B-005-002-004 What is the best conductor among the following materials? **Copper**

B-005-002-005 Which of these types of materials readily allows the flow of electric current? **Conductor**

B-005-002-006 What electrical property causes an object to conduct electricity very well? **Low resistance**

B-005-002-007 The letter “R” is the symbol for: **resistance**

B-005-002-008 What is the inverse of resistance? **Conductance**

B-005-002-009 What is a voltage drop? **The loss of voltage caused by the flow of current through a circuit**

B-005-002-010 The resistance of a conductor changes with: **temperature**

B-005-002-011 Which term describes the direction of current in a DC circuit? **Polarity**

B-005-003-001 What term describes the rate at which electrical energy is used? **Power**

B-005-003-002 If you have light bulbs marked 40 watts, 50 watts, 60 watts and 100 watts, which one will consume electrical energy at the highest rate? **The 100-watt bulb**

B-005-003-003 What is the basic unit of electrical power? **The watt**

B-005-003-004 A circuit consists of a battery and load resistor. What circuit malfunction would cause no current to be drawn from the battery? **An open circuit**

B-005-003-005 Which electrical circuit draws too much current? **A short circuit**

B-005-003-006 Power is expressed in: **watts**

B-005-003-007 Which of the following two quantities should be multiplied together to find power? **Voltage and current**

B-005-003-008 Which two electrical units multiplied together give the unit "watts"? **Volts and amperes**

B-005-003-009 A resistor in a circuit becomes very hot and starts to burn. This is because the resistor is dissipating too much: **power**

B-005-003-010 When speaking of electrical circuits, what does the term "continuity" mean? **The circuit is a closed circuit**

B-005-003-011 You have acquired a transceiver and connected it to a power supply. When you switch on the power supply, its fuse blows immediately. What circuit malfunction caused the fuse to blow? **A short circuit**

B-005-004-001 What is the voltage across a 2-ohm resistor if a current of 0.5 amperes flows through it? **1.0 volts**

B-005-004-002 How is the current in a DC circuit calculated when the voltage and resistance are known? **Current equals voltage divided by resistance**

B-005-004-003 How is the resistance in a DC circuit calculated when the voltage and current are known? **Resistance equals voltage divided by current**

B-005-004-004 How is the voltage in a DC circuit calculated when the current and resistance are known? **Voltage equals current multiplied by resistance**

B-005-004-005 What is the resistance of a circuit that draws 0.25 amperes from a 12-volt source? **48 ohms**

B-005-004-006 What value of resistance is required to drop 9 volts with a current of 10 milliamperes? **900 ohms**

B-005-004-007 If the current flowing through a 50-ohm resistor is 0.44 amperes, what voltage would you measure across the resistor? **22 volts**

B-005-004-008 A 30-ohm resistor is connected across a 6-volt battery. What current does it draw? **0.2 amperes**

B-005-004-009 What voltage is needed to supply a current of 200 milliamperes to operate a relay that has a resistance of 25 ohms? **5 volts**

B-005-004-010 What formula calculates the resistance of a circuit when the voltage and current are known? **R = E / I**

B-005-004-011 What is the resistance of a circuit if it draws 300 milliamperes from a 3-volt battery? **10 ohms**

B-005-005-001 In a parallel circuit with a voltage source and several branch resistors, how is the total current related to the current in the branch resistors? **It equals the sum of the branch current through each resistor**

B-005-005-002 You connect four 100-ohm resistors in parallel across a 12-volt battery. How many milliamperes of current are drawn from the battery? **480 mA**

B-005-005-003 Several resistors of various values are connected in parallel. How does the total resistance of the combination compare to the individual resistors? **It is less than the smallest resistor**

B-005-005-004 Two 1000-ohm resistors are connected in parallel across a 12-volt battery. What is the total current? **24 milliamperes**

B-005-005-005 The total resistance of resistors connected in series is: **greater than the resistance of any one resistor**

B-005-005-006 What is the total resistance of five 10-ohm resistors in series? **50 ohms**

B-005-005-007 Which of these series combination of resistors would replace a single 120-ohm resistor? **Five 24-ohm resistors**

B-005-005-008 If ten resistors of equal value "R" are wired in parallel, what formula yields the total resistance? **R / 10**

B-005-005-009 What is the total resistance of four 68-ohm resistors wired in parallel? **17 ohms**

B-005-005-010 Two resistors are in parallel. Resistor "A" carries twice the current of resistor "B," which means that: **"A" has half the resistance of "B"**

B-005-005-011 The total current in a parallel circuit is equal to the: **sum of the currents through all the parallel branches**

B-005-006-001 Why would a large size resistor be used instead of a smaller one of the same resistance? **For greater power dissipation**

B-005-006-002 A load requires 12 volts DC at 5 amperes. What is the minimum required power transformer rating? **60 watts**

B-005-006-003 What is the DC input power of a transmitter operating at 12 volts and drawing 500 milliamperes? **6 watts**

B-005-006-004 When two 500-ohm 1-watt resistors are connected in series, the maximum total power that can be dissipated by the resistors is: **2 watts**

B-005-006-005 When two 500-ohm 1-watt resistors are connected in parallel, they can dissipate a maximum total power of: **2 watts**

B-005-006-006 If the voltage applied to two resistors in series is doubled, how much will the total power change? **Increase four times**

B-005-006-007 Which of these combinations of resistors could make up a 50-ohm dummy load capable of safely dissipating 5 watts? **Four 2-watt 200-ohm resistors in parallel**

B-005-006-008 How much current is drawn by a 12-volt, 30-watt light bulb? **2.5 amperes**

B-005-006-009 What is the power consumption of two 10-ohm resistors connected in series with a 10-volt battery? **5 watts**

B-005-006-010 What is the advantage of replacing a 50-ohm resistor with a parallel combination of two 100-ohm resistors of the same power rating? **Same resistance but greater power rating**

B-005-006-011 Resistor wattage ratings are: **determined by heat dissipation qualities**

B-005-007-001 What is the term for the number of times per second an alternating current completes a positive to negative cycle? **Frequency**

B-005-007-002 What approximate range of frequencies can most humans hear? **20 Hz to 20 000 Hz**

B-005-007-003 Why is the range of frequencies from 20 Hz to 20 kHz termed audio frequencies? **Because the human ear can sense sound in this range**

B-005-007-004 Electrical energy at a frequency of 7125 kHz is in what frequency range? **High Frequency (HF)**

B-005-007-005 What is the name for the distance an AC signal travels during one complete cycle? **Wavelength**

B-005-007-006 What happens to a signal's wavelength as its frequency increases? **It decreases**

B-005-007-007 What happens to a signal's frequency as its wavelength gets shorter? **It increases**

B-005-007-008 What does 60 hertz (Hz) mean? **60 cycles per second**

B-005-007-009 Two AC waveforms have the same frequency, but their cycles do not begin at the same instant. What term describes that timing difference? **Phase**

B-005-007-010 What is the shape of the waveform of the electricity supplied from a household receptacle? **Sine wave (sinusoidal)**

B-005-007-011 A signal is composed of a fundamental frequency of 2 kHz and another of 4 kHz. What name is given to the 4 kHz signal? **Harmonic**

B-005-008-001 A two-times increase in power results in a change of how many dB? **3 dB higher**

B-005-008-002 What change in transmitter power results in a 3 dB decrease? **Divide the original power by 2**

B-005-008-003 What change in transmitter power results in a 6 dB increase? **Multiply the original power by 4**

B-005-008-004 If a signal transmitted with a power of 200 watts is received with an S-meter reading of "10 dB over S9," what would be the new reading if power was reduced to 20 watts? **S9**

B-005-008-005 If a signal transmitted with a power of 150 watts is received with an S-meter reading of "20 dB over S9," what would be the new reading if power was reduced to 15 watts? **S9 plus 10 dB**

B-005-008-006 What is the "decibel" used for? **To measure the ratio of two signals**

B-005-008-007 The power output from a transmitter increases from 1 watt to 2 watts. How many decibels does that increase represent? **3 dB**

B-005-008-008 The power of a transmitter is increased from 5 watts to 50 watts by a linear amplifier. The power gain, expressed in dB, is: **10 dB**

B-005-008-009 You add a 9 dB gain amplifier to your 2-watt hand-held. What is the power output of the combination? **16 watts**

B-005-008-010 The power of your transmitter is 100 watts and your transmission line introduces a loss of 6 dB. How much power is delivered to the antenna? **25 watts**

B-005-008-011 A local amateur radio operator reports receiving your 100-watt 2-metre simplex transmission with an S-meter reading of "30 dB over S9." What power could you use to reduce that reading to S9? **0.1 W**

B-005-009-001 If two equal-value inductors are connected in series, what is their total inductance? **Twice the value of one inductor**

B-005-009-002 If two equal-value inductors are connected in parallel, what is their total inductance? **Half the value of one inductor**

B-005-009-003 If two equal-value capacitors are connected in series, what is their total capacitance? **Half the value of either capacitor**

B-005-009-004 If two equal-value capacitors are connected in parallel, what is their total capacitance? **Twice the value of one capacitor**

B-005-009-005 You are constructing an air-core inductor using a coil of wire. What parameters determine its inductance? **Coil diameter, coil length and number of turns of wire**

B-005-009-006 A capacitor is made of two identical metal plates separated by air. What parameters determine its capacitance? **Surface area of the plates and spacing between the plates**

B-005-009-007 What precaution must you take when using polarized electrolytic capacitors? **Never apply a reverse voltage**

B-005-009-008 If you wire two 12-millihenry chokes in series, what is the inductance of the combination? **24 millihenries**

B-005-009-009 If you wire two 20-millihenry inductors in parallel, what is the inductance of the combination? **10 millihenries**

B-005-009-010 If you wire two 20-microfarad capacitors in series, what is the capacity of the combination? **10 microfarads**

B-005-009-011 If you wire two 24-microfarad capacitors in parallel, what is the capacity of the combination? **48 microfarads**

B-005-010-001 How does an inductor react to AC? **As the frequency of the applied AC increases, the reactance increases**

B-005-010-002 How does a capacitor react to AC? **As the frequency of the applied AC increases, the reactance decreases**

B-005-010-003 The reactance of capacitors increases as: **frequency decreases**

B-005-010-004 What is the term for the opposition to alternating current caused by the combined effect of reactance and resistance? **Impedance**

B-005-010-005 What term equals the ratio of AC voltage to AC current in a system or circuit? **Impedance**

B-005-010-006 What circuit parameter change causes an inductor's reactance to increase? **An increase in frequency**

B-005-010-007 What property allows a coil wound on a ferrite core to mitigate the effects of an offending radio signal? **High reactance at radio frequencies**

B-005-010-008 What property allows a bypass capacitor in an audio circuit to divert an interfering RF signal? **Low reactance at radio frequencies**

B-005-010-009 What property allows an RF bypass capacitor to have little effect on an audio circuit? **High reactance at audio frequencies**

B-005-010-010 What property allows an RF choke coil to have little effect on signals meant to flow through the coil? **Low reactance at low frequencies**

B-005-010-011 In general, the reactance of inductors increases with: **increasing AC frequency**

B-005-011-001 A transformer with a 120-volt primary voltage supplies 250 watts to a transmitter. Neglecting losses, what is the approximate primary current? **2.1 amperes**

B-005-011-002 How can a transformer with two windings change impedance? **By carrying different voltages and currents in each winding**

B-005-011-003 A transformer with a single 12-volt secondary draws 0.5 amperes through its 120-volt primary. Assuming no losses, what current is drawn from the secondary? **5 amperes**

B-005-011-004 The primary winding of a transformer has 250 turns, and the secondary has 500 turns. If the input voltage is 120 volts, what is the secondary voltage? **240 V**

B-005-011-005 The strength of the magnetic field around a conductor in air is: **directly proportional to the current in the conductor**

B-005-011-006 Maximum induced voltage in a coil occurs when: **current is going through its greatest rate of change**

B-005-011-007 A transformer primary winding consumes 10 watts. Neglecting losses, if the secondary voltage is 5 volts, what is the secondary current? **2 amperes**

B-005-011-008 A step-up transformer with a primary to secondary turns ratio of 1:5 delivers 50 milliamperes to a load. Assuming 100% efficiency, what is the primary current? **250 mA**

B-005-011-009 When is coupling (induction) between two wires maximum? **When the wires are close and parallel**

B-005-011-010 A permanent magnet would most likely be made from: **steel**

B-005-011-011 What confirms the fact that the transfer of energy from the primary to the secondary of a transformer is not perfect? **Warm iron laminations**

B-005-012-001 Resonance is the condition that exists when: **inductive reactance and capacitive reactance are equal**

B-005-012-002 At resonance, what impedance does a parallel tuned circuit exhibit? **High impedance**

B-005-012-003 While the resonant frequency of a tuned circuit is a single frequency, the effect of resonance is significant over a certain range of frequencies. What is this range called? **Bandwidth**

B-005-012-004 What two components are required to form a tuned circuit? **Inductor and capacitor**

B-005-012-005 When a parallel coil-capacitor combination is supplied with AC of different frequencies, there will be one frequency where the impedance will be highest. This is the: **resonant frequency**

B-005-012-006 In a parallel-resonant circuit at resonance, the circuit has: **high impedance**

B-005-012-007 In a series resonant circuit at resonance, the circuit has: **low impedance**

B-005-012-008 A coil and an air-spaced capacitor are arranged to form a resonant circuit. The resonant frequency will remain the same if we: **add a resistor to the circuit**

B-005-012-009 Resonant circuits in a receiver are used to: **select the desired signal frequencies**

B-005-012-010 Resonance is the condition that exists when: **inductive reactance and capacitive reactance are equal and opposite in sign**

B-005-012-011 What happens to current when a series RLC circuit is tuned to the frequency of the source? **It reaches maximum**

B-005-013-001 How is a voltmeter usually connected to a circuit under test? **In parallel with the circuit**

B-005-013-002 How is an ammeter usually connected to a circuit under test? **In series with the circuit**

B-005-013-003 What does a multimeter measure? **Voltage, current and resistance**

B-005-013-004 What is the correct instrument to measure the final power amplifier current? **An ammeter**

B-005-013-005 When measuring the voltage across a circuit component, what does the voltmeter appear to be in the circuit? **A high value resistance**

B-005-013-006 When measuring current drawn from a DC power supply, what does the ammeter placed in the circuit appear as? **A low value resistance**

B-005-013-007 What instrument can provide a direct measurement of power at the output of a transmitter? **RF wattmeter**

B-005-013-008 Potential difference is measured by means of: **a voltmeter**

B-005-013-009 What instrument is used to measure electrical current? **Ammeter**

B-005-013-010 What term describes the ability of an instrument to display values that are true to reality? **Accuracy**

Section 6 - Feedlines and Antenna Systems

B-006-001-001 What connects your transceiver to your antenna? **A transmission line**

B-006-001-002 The characteristic impedance of a transmission line is determined by the: **physical dimensions and relative positions of the conductors**

B-006-001-003 The characteristic impedance of a 20-metre piece of transmission line is 52 ohms. What would the impedance be if 10 metres were cut off? **52 ohms**

B-006-001-004 Why can coaxial cables of different diameters have the same characteristic impedance? **Their characteristic impedance depends on the ratio of conductor diameters**

B-006-001-005 What commonly available transmission line can be buried directly in the ground for some distance without adverse effects? **Coaxial cable**

B-006-001-006 A transmitter is delivering radio frequency (RF) energy into a coaxial cable with a characteristic impedance of 50 ohms. The cable is terminated by a purely resistive load. What value of load resistance will absorb all the RF energy it receives? **50 ohms**

B-006-001-007 What is the major factor influencing the velocity factor of a coaxial cable? **Dielectric material**

B-006-001-008 The characteristic impedance of an open-wire transmission line depends, in part, on the diameter of its conductors. What other dimension determines its characteristic impedance? **Spacing of the conductors**

B-006-001-009 A transmission line is terminated by an impedance that differs significantly from the characteristic impedance of the line. What impedance will be measured at the input of the line? **A value of impedance influenced by line length**

B-006-001-010 What factors determine the characteristic impedance of an open-wire transmission line? **The distance between the centres of the conductors and the diameter of the conductors**

B-006-001-011 What factors determine the characteristic impedance of a coaxial transmission line? **The ratio of the diameter of the outer shield to the diameter of the inner conductor**

B-006-002-001 What kind of transmission line has a centre wire inside an insulating material that is covered by a metal shield or sleeve? **Coaxial cable**

B-006-002-002 What kind of transmission line has two wires side-by-side embedded in insulating material? **Window line**

B-006-002-003 What kind of transmission line is made of two conductors held apart by insulated rods? **Open-wire line**

B-006-002-004 What is the purpose of a balun? **Connect balanced and unbalanced systems**

B-006-002-005 Where would you install a balun to feed a dipole antenna with 50-ohm coaxial cable? **Between the coaxial cable and the antenna**

B-006-002-006 What causes a transmission line to be unbalanced? **One conductor is connected to ground**

B-006-002-007 What device can be installed to feed a balanced antenna with an unbalanced transmission line? **A balun**

B-006-002-008 What device should you use to connect a coaxial cable to window line? **A balun**

B-006-002-009 A balanced transmission line: **is made of two parallel wires**

B-006-002-010 Your antenna tuner does not have a balanced output and you wish to use window line to feed an HF antenna. What device should you use between the tuner and the transmission line? **Balun**

B-006-002-011 What kind of transmission line has two conductors maintained side by side, a constant distance apart, using insulated spreaders? **Open-wire line**

B-006-003-001 A transmission line must be supported for several metres by attaching it to a metal fence. What type of transmission line will NOT be adversely affected by proximity to the fence? **Coaxial cable**

B-006-003-002 A common-mode current choke can be made by winding coaxial cable on a ferrite toroid. Why is cable with solid dielectric preferred over foam dielectric? **Less risk of a short due to centre conductor movement**

B-006-003-003 Why do most amateur radio antenna systems use coaxial cable, rather than other types of transmission line? **More usable in a wide variety of settings**

B-006-003-004 What type of connector is commonly installed on RG-213 coaxial cable for connection to an HF transceiver? **A PL-259 connector**

B-006-003-005 What type of connector usually joins a modern hand-held transceiver to its antenna? **An SMA connector**

B-006-003-006 Which popular RF connector is designed to be moisture resistant? **N**

B-006-003-007 What type of RF connector is commonly used for low-power transceivers and test instruments? **BNC**

B-006-003-008 Why should you regularly clean and tighten all antenna connectors? **To help keep their contact resistance at a minimum**

B-006-003-009 What type of coaxial outer conductor offers the best shielding? **Solid shield**

B-006-003-010 If your location is frequently affected by icing conditions, which type of transmission line would be the most suitable? **Coaxial cable**

B-006-003-011 What is the primary advantage of choosing a coaxial cable with a foam dielectric instead of a solid dielectric? **Lower loss**

B-006-004-001 What is the major adverse consequence of using RG-58 coaxial cable for a transmission line operating on the 70 cm band? **Excess RF loss in the transmission line**

B-006-004-002 What is the major advantage of open-wire transmission line? **It can be operated at high SWR without excessive loss**

B-006-004-003 If your transmitter and antenna are 15 metres apart, but are connected by 60 metres of RG-58 coaxial cable, what should be done to reduce transmission line loss? **Shorten the excess cable**

B-006-004-004 As the length of a transmission line is changed, what happens to signal loss? **Signal loss increases as the length increases**

B-006-004-005 As the frequency of a signal is changed, what happens to signal loss in a transmission line? **Signal loss increases with increasing frequency**

B-006-004-006 Assuming the same transmitter and RF output power are used, what is the effect of changing the transmission line from RG-213 coaxial cable to RG-58? **Less RF power is radiated from the antenna**

B-006-004-007 The lowest loss transmission line on HF is: **open-wire line**

B-006-004-008 In what values are RF transmission line losses expressed? **Decibel per unit length**

B-006-004-009 If the length of a coaxial transmission line is increased from 20 metres to 40 metres, how would this affect the line loss? **It would be increased by 100%**

B-006-004-010 If the operating frequency is increased, how does the transmission line loss change? **Loss increases, due to internal line losses**

B-006-005-001 What does an SWR reading of 1:1 mean? **The best impedance match has been attained**

B-006-005-002 What does an SWR reading of less than 1.5:1 mean? **A fairly good impedance match**

B-006-005-003 What is the most likely cause of erratic readings on an SWR meter? **Intermittent connection in the antenna system**

B-006-005-004 Which of the following can cause a high SWR reading? **An open or short circuit in the antenna system**

B-006-005-005 What is the main adverse effect due to operating with high SWR? **Increased transmission line loss**

B-006-005-006 What instrument is useful in adjusting the physical length of an antenna? **Antenna analyzer**

B-006-005-007 If the characteristic impedance of the transmission line does not match the antenna input impedance then: **standing waves are produced in the transmission line**

B-006-005-008 The result of the presence of standing waves on a transmission line is: **reduced transfer of RF energy to the antenna**

B-006-005-009 What does an SWR meter measure to determine the SWR? **Forward and reflected voltage**

B-006-005-010 What information can be obtained with an antenna analyzer? **SWR of the antenna system over a range of frequencies**

B-006-005-011 What is the effect of line loss on the SWR reading at the station? **It decreases the SWR, because reflected energy is attenuated**

B-006-006-001 Which of the following antenna system conditions will cause a modern solid-state HF transceiver to automatically reduce power? **Excessive impedance mismatch between transceiver and transmission line**

B-006-006-002 What does an antenna tuner do? **It matches a transceiver to a mismatched antenna system**

B-006-006-003 An end-fed half-wave antenna (EFHW) has a very high feed point impedance. What device could be used to provide a good match to 50-ohm coaxial cable? **A transformer**

B-006-006-004 If both source and load impedances are purely resistive, what value of load impedance will result in maximum power delivery to the load? **Load impedance equal to the source impedance**

B-006-006-005 What is the advantage of locating an antenna tuner near the antenna feed point, over locating it near the transceiver? **Less transmission line loss**

B-006-006-006 How does an antenna tuner compensate for an impedance mismatch in an antenna system? **By adding capacitive or inductive reactance**

B-006-006-007 What advantage does a transformer present when used for impedance matching at radio frequencies? **It can be designed to do so over a wide bandwidth**

B-006-006-008 Where does impedance matching need to be done to minimize transmission line losses in an antenna system? **At the junction between the transmission line and antenna**

B-006-006-009 If an antenna is correctly matched to a transmission line, the length of the transmission line: **will have no effect on the matching**

B-006-006-010 Why is an antenna tuner (external or internal) frequently used with modern solid-state transceivers? **It enables the transceivers to deliver rated power to a mismatched antenna system**

B-006-006-011 If a transmission line with a characteristic impedance of 50 ohms feeds a folded dipole with a feed point impedance close to 300 ohms, what impedance transformation ratio is needed to match the two? **6:1**

B-006-007-001 What does horizontal wave polarization mean? **The electric lines of force of a radio wave are parallel to the Earth's surface**

B-006-007-002 What does vertical wave polarization mean? **The electric lines of force of a radio wave are perpendicular to the Earth's surface**

B-006-007-003 What electromagnetic wave polarization does a Yagi antenna have when its elements are parallel to the Earth's surface? **Horizontal**

B-006-007-004 What electromagnetic wave polarization does a half-wavelength antenna have when it is perpendicular to the Earth's surface? **Vertical**

B-006-007-005 Polarization of an antenna is determined by: **the orientation of the electric field relative to the Earth's surface**

B-006-007-006 An isotropic antenna is: **a hypothetical point source**

B-006-007-007 What is the three-dimensional radiation pattern of an isotropic radiator? **A sphere**

B-006-007-008 VHF signals from a mobile station using a vertical whip antenna will normally be best received using a: **vertical ground-plane antenna**

B-006-007-009 A dipole antenna will emit a vertically polarized wave if it is: **mounted vertically**

B-006-007-010 If an electromagnetic wave leaves an antenna vertically polarized and reaches the receiving location by ground wave, what will be its final polarization? **Vertical**

B-006-007-011 Compared with a horizontal antenna, a vertical antenna will receive a vertically polarized radio wave: **at higher strength**

B-006-008-001 A wire dipole has a resonant frequency of 3900 kHz. How can you change its resonant frequency to 3600 kHz? **Make it longer**

B-006-008-002 A wire dipole has a resonant frequency of 3600 kHz. How can you change its resonant frequency to 3900 kHz? **Make it shorter**

B-006-008-003 What is the wavelength in free space of a 25 MHz signal? **12 metres**

B-006-008-004 The velocity of propagation of radio frequency energy in free space is: **300 000 kilometres per second**

B-006-008-005 Adding a series inductance to an antenna would: **decrease the resonant frequency**

B-006-008-006 The resonant frequency of an antenna may be increased by: **shortening the radiating element**

B-006-008-007 The speed of a radio wave: **is the same as the speed of light**

B-006-008-008 Why are insulators used at the ends of a suspended wire antenna? **To limit the electrical length of the antenna**

B-006-008-009 To lower the resonant frequency of an antenna, the operator should: **lengthen it**

B-006-008-010 Some antennas are constructed with traps. What is a trap? **A coil and capacitor in parallel**

B-006-008-011 What is the wavelength in free space of a 2 MHz signal? **150 metres**

B-006-009-001 How is a parasitic antenna element energized? **By induction or radiation from a driven element**

B-006-009-002 How can the directivity of a half-wave dipole be increased? **By adding one or more parasitic elements**

B-006-009-003 If a half-wave dipole is converted to a Yagi by adding a slightly shorter parasitic element, in what direction(s) does the radiation strength increase? **From the dipole towards the new element**

B-006-009-004 If a half-wave dipole is converted to a Yagi by adding a slightly longer element, in what direction(s) does the radiation strength increase? **From the new element towards the dipole**

B-006-009-005 The property of an antenna that defines the range of frequencies to which it will respond, is called its: **bandwidth**

B-006-009-006 What is the approximate gain of a half-wave dipole in free space relative to an isotropic radiator? **2.1 dB**

B-006-009-007 What is meant by antenna gain? **The ratio of the radiated signal strength of an antenna to that of a reference antenna**

B-006-009-008 What is meant by antenna bandwidth? **The frequency range over which the antenna may be expected to perform well**

B-006-009-009 In free space, what is the radiation pattern of a half-wave dipole? **Maximum radiation broadside from the antenna**

B-006-009-010 The gain of an antenna, especially on VHF and above, is quoted in dBi. The "i" in this expression stands for: **isotropic**

B-006-009-011 An antenna is said to have a gain of 4.1 dBi. How much gain is this over a half-wave dipole antenna? **2.0 dB**

B-006-010-001 How do you calculate the approximate length in metres of a quarter-wavelength antenna for use on frequencies below 30 MHz? **Divide 71.3 by the operating frequency in MHz**

B-006-010-002 If you made a quarter-wavelength vertical antenna for 21.125 MHz, approximately how long would it be? **3.37 metres**

B-006-010-003 If you made a half-wavelength vertical antenna for 223 MHz, approximately how long would it be? **67 cm**

B-006-010-004 Why is a five-eighths wavelength vertical antenna better than a quarter-wavelength vertical antenna for VHF or UHF mobile operations? **Because it has more gain**

B-006-010-005 If a quarter-wavelength vertical antenna is placed on the roof of a car, in what direction does it send out radio energy? **It goes out equally well in all horizontal directions**

B-006-010-006 What is an advantage of downward sloping radials on a ground plane antenna? **It brings the feed point impedance closer to 50 ohms**

B-006-010-007 What configuration of radials will match an elevated quarter-wave vertical antenna to a 50-ohm coaxial cable? **Downward sloping quarter-wave radials**

B-006-010-008 Which of the following transmission lines will give the best match to the base of a quarter-wave ground-plane antenna? **50-ohm coaxial cable**

B-006-010-009 How can a vertical antenna, 2 metres in length, be made to resonate in the 80-metre band for mobile use? **Install an inductor in series with the antenna**

B-006-010-010 Why is a loading coil often used with an HF mobile vertical antenna? **To tune out capacitive reactance**

B-006-010-011 When using a ground mounted vertical HF antenna, what can you do to reduce ground losses? **Install a wire ground system (radials) at the antenna base**

B-006-011-001 What design feature allows a single Yagi antenna to function on the 20-metre, 15-metre and 10-metre bands? **Element traps**

B-006-011-002 What is the approximate length of the driven element of a Yagi antenna for 14.0 MHz? **10.21 metres**

B-006-011-003 What is the approximate length of the director element of a Yagi antenna for 21.1 MHz? **6.44 metres**

B-006-011-004 What is the approximate length of the reflector element of a Yagi antenna for 28.1 MHz? **5.34 metres**

B-006-011-005 What is one effect of increasing the boom length and adding directors to a Yagi antenna? **Gain increases**

B-006-011-006 What is the major advantage of increasing element spacing on a Yagi antenna? **Higher gain**

B-006-011-007 Why are Yagi antennas often used on HF bands from 20 metres to 10 metres? **Rotatable high-gain antennas become feasible due to shorter element lengths**

B-006-011-008 What does "antenna front-to-back ratio" mean in reference to a Yagi antenna? **The ratio of the power radiated in the forward direction to the power radiated in the opposite direction**

B-006-011-009 How can the bandwidth of a Yagi antenna be increased? **Increase the diameter of the elements**

B-006-011-010 For a three-element Yagi antenna, what approximate element spacing (in wavelengths) provides the best compromise between gain and front-to-back ratio? **0.20**

B-006-011-011 If the forward gain of a six-element Yagi is about 10 dBi, what would the gain of two of these antennas be if they were "stacked"? **13 dBi**

B-006-012-001 If you made a half-wavelength dipole antenna for 28.150 MHz, approximately how long would it be? **5.08 metres**

B-006-012-002 What is one disadvantage of a random wire antenna? **You may experience RF feedback in your station**

B-006-012-003 What is the three-dimensional radiation pattern of a half-wavelength dipole in free space? **A torus (donut shape) around the antenna**

B-006-012-004 What is the impedance at the feed point of a half-wave dipole in free space? **73 ohms**

B-006-012-005 Ignoring ground effects, what is the radiation pattern of a horizontal half-wave dipole installed with the ends pointing North/South? **Radiates mostly to the East and West**

B-006-012-006 What is a major advantage of an end-fed half-wave antenna (EFHW)? **Capable of multi-band operation**

B-006-012-007 What is a disadvantage of using an antenna equipped with traps? **It may radiate harmonics more readily**

B-006-012-008 What is an advantage of using a trap antenna? **It may be used for multi-band operation**

B-006-012-009 If you were to cut a half-wave dipole for 3.75 MHz, what would be its approximate length? **38.13 metres**

B-006-013-001 What is a quad antenna? **Two or more parallel four-sided wire loops, each approximately one wavelength long**

B-006-013-002 What is a delta loop antenna with parasitic elements? **An antenna consisting of multiple elements, each a triangular loop whose total length is approximately one wavelength**

B-006-013-003 What is the approximate length of the driven element of a quad antenna designed for 21.4 MHz? **14.30 metres**

B-006-013-004 What is the approximate length of the driven element of a quad antenna designed for 14.3 MHz? **21.40 metres**

B-006-013-005 What is the approximate length of a delta loop antenna designed for 28.7 MHz? **10.66 metres**

B-006-013-006 What is a major disadvantage of a quad antenna, as compared to a Yagi antenna with the same number of elements and boom length? **More susceptible to weather damage**

B-006-013-007 You are constructing an HF delta loop antenna. It is oriented with the bottom element parallel to the ground. Where should you locate the feed point for horizontal polarization? **In the centre of the bottom element**

B-006-013-008 Moving the feed point of a quad antenna from a side parallel to the ground to a side perpendicular to the ground will have what effect? **It will change the antenna polarization from horizontal to vertical**

B-006-013-009 What is the approximate length of the wire for a horizontal loop tuned at 7.15 MHz? **42.80 metres**

B-006-013-010 The quad antenna consists of two or more square loops of wire. The driven element has an approximate overall length of: **one wavelength**

B-006-013-011 What is the approximate overall length of a delta loop antenna? **One wavelength**

Section 7 - Radio Wave Propagation

B-007-001-001 What type of wave propagation usually occurs between two nearby VHF transceivers? **Line-of-sight**

B-007-001-002 What does near vertical incidence sky-wave (NVIS) propagation enable? **Medium range HF communications, especially in difficult terrain**

B-007-001-003 When a signal is returned to Earth by the ionosphere, what is this called? **Sky-wave propagation**

B-007-001-004 On VHF and higher frequencies, why does the radio horizon extend beyond the visible horizon? **Normal refraction in the troposphere**

B-007-001-005 What type of wave is commonly known as sky wave? **Ionospheric wave**

B-007-001-006 What portion of a radio signal is directly affected by the surface of the Earth? **Ground wave**

B-007-001-007 What makes radiocommunication out to 200 km possible at lower HF frequencies during the daytime? **Ground wave**

B-007-001-008 Considering the bands from 160 metres to 6 metres, which band offers the greatest ground-wave propagation distance? **160 metres**

B-007-001-009 What type of radio wave follows a path from the transmitter to the ionosphere and back to Earth? **Sky wave**

B-007-001-010 Reception of high frequency (HF) radio waves beyond 4000 km is generally made possible by: **ionospheric wave**

B-007-002-001 What causes the ionosphere to form? **Solar radiation ionizing the outer atmosphere**

B-007-002-002 What type of solar radiation is most responsible for ionization in the outer atmosphere? **Ultraviolet**

B-007-002-003 Which ionospheric region is closest to the Earth? **The D region**

B-007-002-004 Which region of the ionosphere is the least useful for long-distance radio-wave propagation? **The D region**

B-007-002-005 Which region of the ionosphere separates into two sub-regions in the daytime? **The F region**

B-007-002-006 When is the ionosphere most ionized? **Midday**

B-007-002-007 When is ionization at a minimum in the ionosphere? **Shortly before dawn**

B-007-002-008 Why is the F2 region mainly responsible for the longest distance radio-wave propagation? **Because it is the highest ionospheric region**

B-007-002-009 What is the main reason the 160-metre and 80-metre bands tend to be useful only for short-distance communications during daylight hours? **Because of D region absorption**

B-007-002-010 During the day, what two sub-regions appear in the ionosphere? **F1 and F2**

B-007-002-011 What is the position of the E region in the ionosphere? **Below the F region**

B-007-003-001 What term describes an area that is too distant for reception of ground waves, but too close for reception of ionospheric waves? **Skip zone**

B-007-003-002 What is the maximum distance along the Earth's surface that is normally covered in one hop using the F2 region? **4 000 km**

B-007-003-003 What is the maximum distance along the Earth's surface that is normally covered in one hop using the E region? **2000 km**

B-007-003-004 Skip zone is: **a zone between the end of the ground wave and the point where the first ionosphere-refracted wave returns to Earth**

B-007-003-005 The distance to Europe from your location is approximately 5000 km. What type of high frequency (HF) propagation is the most likely to work? **Multi-hop**

B-007-003-006 Assuming constant ionosphere region height, how does a higher radiation angle affect skip distance? **It decreases, due to the geometry of the signal path**

B-007-003-007 On a double-hop path involving the surface of the Earth as a middle point, what phenomenon returns the radio wave to the ionosphere? **Reflection**

B-007-003-008 Skip distance is the: **minimum distance reached by a signal after one reflection by the ionosphere**

B-007-003-009 Skip is a term associated with signals from the ionosphere. What causes skip? **Refraction by the ionosphere**

B-007-003-010 The skip distance of a sky wave will be greatest when the: **angle between the ground and the emitted radiation is smallest**

B-007-003-011 How does an increase in the height of the refracting region affect skip distance? **It increases, due to the geometry of the signal path**

B-007-004-001 What effect does the D region of the ionosphere have on lower frequency HF waves in the daytime? **It absorbs the waves**

B-007-004-002 Why can you not hear distant 160-metre and AM broadcast stations during daytime hours? **The ionization of the D region**

B-007-004-003 A radio transmission may follow two or more different paths during propagation, and this may result in phase differences at the receiver. What is the effect at the receiver? **Fading**

B-007-004-004 While using a 2-metre hand-held transceiver in an urban setting, you notice that moving less than one metre can severely attenuate your received signal. What is the likely cause? **Signals arriving on different paths cancel one another**

B-007-004-005 A transmitted radio signal reaches a receiver by both one-hop and two-hop skip paths. What can small changes in the ionosphere cause? **Variations in signal strength**

B-007-004-006 What can be done to continue HF communications during a sudden ionospheric disturbance (SID)? **Try a higher frequency band**

B-007-004-007 On the VHF and UHF bands, the polarization of the receiving antenna in relation to the transmitting antenna is very important, yet on HF bands it is relatively unimportant. Why is that so? **The refraction in the ionosphere changes the wave's polarization**

B-007-004-008 What causes selective fading? **Phase differences between radio wave components of the same transmission, as experienced at the receiving station**

B-007-004-009 How does the bandwidth of a transmitted signal affect selective fading? **It is more pronounced at wide bandwidths**

B-007-004-010 What effect do refraction, reflection and Faraday rotation have on a radio wave? **Change the polarization**

B-007-004-011 If a radio transmission follows two or more different paths during propagation, the received signal may degrade due to fading. What other type of degradation can occur? **Phase distortion**

B-007-005-001 How do sunspots change the ionization of the atmosphere? **The more sunspots there are, the greater the ionization**

B-007-005-002 How long is an average sunspot cycle? **11 years**

B-007-005-003 What is solar flux? **The radio frequency energy emitted by the sun**

B-007-005-004 What is the solar-flux index? **A measure of solar activity that is taken at a specific frequency**

B-007-005-005 What influences all radiocommunication beyond ground wave or line-of-sight ranges? **Solar radiation**

B-007-005-006 What effect of the sun's activity influences ionospheric propagation on a daily basis? **Electromagnetic and particle radiation**

B-007-005-007 When sunspot numbers are high, how is propagation affected? **Frequencies up to 40 MHz or even higher become usable for long-distance communication**

B-007-005-008 All communication frequencies throughout the spectrum are affected in varying degrees by: **the sun**

B-007-005-009 Average duration of a solar cycle is: **11 years**

B-007-005-010 The ability of the ionosphere to refract high frequency radio signals depends on: **the amount of solar radiation**

B-007-005-011 What is the major cause of cyclical changes in HF propagation? **Solar cycle**

B-007-006-001 Observatories probe the ionosphere at vertical incidence. What term describes the highest frequency that a region can reflect at the time? **Critical frequency**

B-007-006-002 What causes the maximum usable frequency to vary? **The amount of radiation received from the sun**

B-007-006-003 What does maximum usable frequency mean? **The highest frequency at which a signal will reach a given destination**

B-007-006-004 Why is communication possible between two continents at a frequency above the local critical frequency? **The signal enters the ionosphere at an oblique (inclined) angle**

B-007-006-005 What is one way to determine if the maximum usable frequency (MUF) is high enough to support 28 MHz propagation between your station and western Europe? **Listen for 10-metre beacon stations**

B-007-006-006 What usually happens to radio waves with frequencies below the maximum usable frequency (MUF) when they are sent into the ionosphere? **They are bent back to the Earth**

B-007-006-007 At what point in the solar cycle does the 20-metre band usually support worldwide propagation during daylight hours? **At any point in the solar cycle**

B-007-006-008 What happens daily when the solar UV radiation increases? **The maximum usable frequency increases**

B-007-006-009 When is propagation on the 80-metre band generally the LEAST effective? **Daytime in summer**

B-007-006-010 The optimum working frequency provides the best long-range HF communication. Compared with the maximum usable frequency (MUF), it is usually: **slightly lower**

B-007-006-011 During summer daytime, which bands are the most difficult for communications beyond ground wave? **160 metres and 80 metres**

B-007-007-001 Which ionospheric region most affects sky-wave propagation on the 6-metre band? **The E region**

B-007-007-002 What effect does tropospheric bending have on 2-metre radio waves? **It lets you contact stations farther away**

B-007-007-003 What causes tropospheric ducting of radio waves? **A temperature inversion**

B-007-007-004 What term describes that portion of a transmitted wave kept close to the Earth's surface due to bending in the atmosphere? **Tropospheric wave**

B-007-007-005 What is a sporadic-E condition? **Patches of dense ionization at E-region height**

B-007-007-006 On which amateur radio band is the extended-distance propagation effect of sporadic-E most often observed? **6 metres**

B-007-007-007 In the northern hemisphere, in which direction should a directional antenna be pointed to take maximum advantage of auroral propagation? **North**

B-007-007-008 Where in the ionosphere does auroral activity occur? **At E-region height**

B-007-007-009 Which analog emission mode is the most reliable in auroral propagation? **CW, because it is readable even when distorted**

B-007-007-010 Excluding enhanced propagation modes, what is the approximate range of normal VHF tropospheric propagation? **800 km**

B-007-007-011 What effect is responsible for propagating a VHF signal over 800 km? **Tropospheric ducting**

B-007-008-001 What kind of unusual HF propagation allows weak signals from the skip zone to be heard? **Scatter-mode**

B-007-008-002 If you receive a weak, distorted signal close to the maximum usable frequency, what type of propagation is probably occurring? **Scatter**

B-007-008-003 What type of VHF/UHF propagation depends upon small variations in density and water-vapour content? **Tropospheric scatter**

B-007-008-004 What makes HF scatter signals often sound distorted? **Energy scattered into the skip zone through several radio-wave paths**

B-007-008-005 Why are HF scatter signals usually weak? **Only a small part of the signal energy is scattered into the skip zone**

B-007-008-006 What type of propagation may allow a weak high frequency (HF) signal to be heard at a distance too far for ground-wave propagation but too near for normal sky-wave propagation? **Scatter**

B-007-008-007 On the HF bands, when is scatter propagation most likely involved? **When you receive weak and distorted signals near the maximum usable frequency (MUF)**

B-007-008-008 Tropospheric scatter frequently explains VHF/UHF communications well beyond the radio horizon. What makes this propagation mode possible? **Small variations in the properties of the lower atmosphere**

B-007-008-009 Meteor scatter is most effective on what band? **6 metres**

B-007-008-010 What is the effect of scattering on a radio wave? **The wave gets redirected in many directions**

B-007-008-011 In which frequency range is meteor scatter most effective for extended-range communication? **30 MHz to 100 MHz**

Section 8 - Interference and Suppression

B-008-001-001 What is the cause of receiver overload? **Very strong signal from a transmitter**

B-008-001-002 What is one way to tell if your HF transmitter causes front-end overload interference to a neighbour's receiver? **Transmitting on various frequencies produces similar interference**

B-008-001-003 If a neighbour reports television interference whenever you transmit, no matter what band you use, what is probably the cause of the interference? **Receiver overload**

B-008-001-004 What type of filter should be connected to a TV receiver as the first step in trying to prevent receiver overload from an amateur radio HF transmission? **High-pass**

B-008-001-005 During a club Field Day outing, reception on the 20-metre SSB station is compromised every time the 20-metre CW station is on the air. What might cause such interference? **Receiver desensitization**

B-008-001-006 The signals from two commercial transmitters combine outside your receiver to produce noise on a desired frequency. What type of interference is this? **Intermodulation**

B-008-001-007 You have connected your hand-held VHF transceiver to an outside gain antenna. You now hear a mixture of signals together with different modulation on your desired frequency. What is the nature of this interference? **Receiver intermodulation**

B-008-001-008 Two or more strong signals mix in your receiver to produce interference on a desired frequency. What is this called? **Intermodulation interference**

B-008-001-009 Two mobile stations are communicating through a repeater. As they arrive in close proximity to each other, they begin to have difficulty communicating. What is the most likely cause? **Transmitter signals are desensitizing the receivers**

B-008-001-010 A television receiver suffers interference on channel 5 (76 MHz - 82 MHz) only when you transmit on 14 MHz. From your home you see the tower of a commercial FM station known to broadcast on 92.5 MHz. Which of these solutions would you try first? **Insert a high-pass filter at the television receiver**

B-008-001-011 You are experiencing interference in your VHF receiver. You have determined that signals from two nearby transmitters are mixing in your receiver to cause the interference. What device can you install to reduce the interference? **Suitable filter at the receiver**

B-008-002-001 What devices would you install to reduce or eliminate interference to a home entertainment system from an HF transmitter? **Coils on ferrite cores**

B-008-002-002 What should be done if a properly operating amateur radio station is the cause of interference to a nearby telephone? **Install a modular plug-in telephone RFI filter close to the telephone device**

B-008-002-003 What sound is heard from a public address system if audio rectification of a nearby single-sideband transmission occurs? **Distorted speech from the transmitter's signals**

B-008-002-004 What sound is heard from a public address system if audio rectification of a nearby CW transmission occurs? **On-and-off humming or clicking**

B-008-002-005 If an amateur radio transmission is heard in a device that contains no RF components, what type of interference is this? **Audio rectification**

B-008-002-006 An amateur radio transmitter is being heard across the entire dial of a broadcast receiver. The receiver is most probably suffering from: **audio rectification**

B-008-002-007 Your SSB HF transmissions are heard muffled on a sound system in the living room regardless of its volume setting. What causes this? **Audio rectification of strong signals**

B-008-002-008 What device can be used to minimize the effect of RF pickup by audio wires connected to stereo speakers, intercom amplifiers, telephones, etc.? **Coil on ferrite core**

B-008-002-009 Stereo speaker leads often act as antennas to pick up RF signals. What is one method you can use to minimize this effect? **Shorten the leads**

B-008-002-010 One method of preventing RF from entering a stereo set through the speaker leads is to wrap each of the speaker leads: **around a ferrite core**

B-008-002-011 You are using an HF off-centre-fed (OCF) unbalanced antenna. When you transmit on SSB, distorted audio and noise are heard from an outboard amplified speaker. What device could you install in the transmission line to mitigate this problem? **A common-mode choke**

B-008-003-001 What term describes the undesired creation of new frequency components when one or more signals enter a non-linear device? **Intermodulation**

B-008-003-002 If someone tells you that signals from your hand-held transceiver are interfering with other signals on a frequency near yours, what could be the cause? **Your hand-held is transmitting spurious emissions**

B-008-003-003 If your transmitter sends signals outside the band where it is transmitting, what is this called? **Spurious emissions**

B-008-003-004 What problem may occur if your transmitter is operated without its cover or other shielding in place? **It may radiate spurious emissions**

B-008-003-005 In Morse code transmission, local RF interference (key clicks) is produced by: **the making and breaking of the circuit at the Morse key**

B-008-003-006 Key clicks, heard from a Morse code transmitter at a distant receiver, are the result of: **too sharp rise and decay times of the keyed carrier**

B-008-003-007 In a Morse code transmission, broad bandwidth RF interference (key clicks) heard at a distance is produced by: **poor shaping of the waveform**

B-008-003-008 What should you do if you learn your transmitter is producing key clicks? **Check the keying filter and the functioning of later stages**

B-008-003-009 What term describes an unwanted oscillation in an amplifier or oscillator circuit? **Parasitic oscillation**

B-008-003-010 What can cause parasitic oscillations in a stage? **Unwanted positive feedback**

B-008-003-011 Transmitter RF amplifiers can generate parasitic oscillations: **above or below the transmitter frequency**

B-008-004-001 If a neighbour reports television interference on one or two channels only when you transmit on 15 metres, what is probably the cause of the interference? **Harmonic emissions from your transmitter**

B-008-004-002 What are harmonic emissions? **Unwanted signals at frequencies which are multiples of the fundamental (operating) frequency**

B-008-004-003 Why are harmonic emissions from an amateur radio station not wanted? **They may cause interference to other stations**

B-008-004-004 What term describes unwanted radio energy transmitted just outside the necessary bandwidth? **"Out-of-band" emissions**

B-008-004-005 If you are told your station was heard on 21.375 MHz but at the time you were operating on 7.125 MHz. What is one reason that could cause this to happen? **Your transmitter radiates harmonic signals**

B-008-004-006 What causes splatter interference? **Overmodulating a transmitter**

B-008-004-007 A television tuned to channel 3 (60 MHz - 66 MHz) experiences interference when you are transmitting on the 15-metre band. Other channels are not affected. What is the most likely cause? **Harmonic emission from your transmitter**

B-008-004-008 What is the probable cause of "flat topping" (non-linear operation) of an amplifier in an SSB transmitter? **Excessive microphone gain**

B-008-004-009 Which of the following may cause excessive harmonics in a transmitter? **Overdriven stages**

B-008-004-010 An interfering signal from an HF transmitter is found to have a frequency of 56 MHz. What could be the source? **Second harmonic of a 10-metre transmission**

B-008-004-011 Harmonics may be produced in the RF power amplifier of a transmitter if: **excessive drive signal is applied to it**

B-008-005-001 What is the frequency response of an ideal notch filter? **Attenuate one frequency and pass all others**

B-008-005-002 A filter attenuates frequencies below its cut-off frequency of 60 MHz. What type of filter is it? **High-pass**

B-008-005-003 What type of filter attenuates RF energy above and below a certain range of frequencies? **Band-pass**

B-008-005-004 Why should the impedance of a filter match the transmission line where it is inserted? **To avoid unwanted reflection**

B-008-005-005 Listening to shortwave on a low-cost software defined receiver (SDR), you hear several stations known to operate on much higher frequencies. What type of filter could help? **Low-pass**

B-008-005-006 You need to install an AC line filter to reduce radio frequency noise heard in your station equipment. What type of frequency response should it have? **Low-pass**

B-008-005-007 A strong interfering signal is very close to your receive frequency. Which type of filter can effectively suppress it? **Notch**

B-008-005-008 In a Field Day operation with separate transmitters assigned to specific bands, what type of filter is needed on the receivers to minimize interference? **Band-pass**

B-008-005-009 A nearby high-power HF broadcast station in the 31-metre band is interfering with your reception on the 40-metre and 30-metre bands. What type of filter is needed on the receiver to minimize interference? **Band-reject**

B-008-005-010 Your 2-metre station suffers receiver overload from several land mobile service transmitters on adjacent bands. What type of filter could help? **Band-pass**

B-008-005-011 A filter attenuates frequencies above its cut-off frequency of 40 MHz. What type of filter is it? **Low-pass**