NOVICE
FCC License Preparation
Element 2

To go to an explanation press the Search button and select the required question designator.

N1A01:

You should obtain a copy of Part 97 of Title 47 of the Code of Federal Regulations. The PART97.HLP file in the NuTest package contains the entire text of this document. [97]

N1A02:

The FCC makes and enforces amateur radio rules in the United States and certain other territories. [97]

N1A03:

The FCC rules determine operation standards, technical standards of equipment and emergency communications.

The rules do not cover operating procedures or repeater locations. Station construction standards may be covered by other regulations but are not part of the FCC rules. The only exception to this is a general requirement for safe practices. Although knowledge of Ohms law is required to answer some Novice Class Theory questions it is not part of the FCC rules. [97]

N1A04:

Specific station construction standards are not part of the FCC rules and regulations. Your station is, however, required to be constructed so that it is safe for you and other people. [97.101]

N1A05:
Section 97.1 of the FCC rules explains the official reasons for the existence of this hobby. [97.1]

N1A06:

The Federal Communications Commission rules, Part 97.1 lists the fundamental purposes of the amateur radio service.

To increase the number of trained operators and electronics experts. is specifically mentioned in paragraph d).

To improve international goodwill, is mentioned in paragraph e).

[97.1]

N1A07:
When you have passed:

a) The Novice written theory exam
b) The 5 words-per-minute Morse code test

You will be eligible to apply to the FCC for a ten-year license to operate an amateur radio station. If you do not already have it the Windows Morse code trainer NuMorse is highly recommended for studying the Morse code. [97.3]

N1A08:

Paragraph 4), section 97.3 of the FCC rules defines the amateur service. This paragraph specifies that we pursue our hobby out of interest, for fun, and not for commercial gain. [97.3]

N1A09:

In the FCC rules an amateur station is defined as A station in an amateur radio service consisting of the apparatus necessary for carrying on radio communications.. The apparatus means the radio equipment you need to carry out amateur communications. [97.3]

N1A10:

If you are the licensee then this is you, or another licensed radio amateur designated by you. The control operator is responsible for ensuring that station operation is within the FCC rules. [97.3]

N1A11:
Volunteer examiners (VEs) administer all amateur radio written examinations. [97.525]

N1B01:
An amateur license permits you to transmit on amateur service frequencies only. [97.5]

N1B02:

Once licensed you may operate an amateur radio station in any region that is administered by the FCC without any special permissions. Section 97.11
of the FCC document lists some extra rules for operation aboard aircraft and ships. [97.5]

N1B03:

The FCC Form 610 plus license fee are sent to the FCC. Some portions of the form are to be filled in by you, other portions by the VE who administers your examination. If you have a severe disability that makes it impossible for you to take a Morse code test then a section of the Form 610 is to be completed by a physician. On receipt of the Form 610 and fee the FCC will issue your unique call sign. [97.5]

N1B04:

You may operate wherever the FCC has jurisdiction; these places are listed in the appendix to the FCC rules. Special rules apply for amateur radio stations aboard ships or aircraft. [97.11]

N1B05:
There is no limit to the number of radios at your station. [97.5]

N1B06:

Keep the original of your license safe at your primary station. Make copies for other sites that you operate from.97.5]

N1B07:

European amateur radio operators are not allowed to control a US amateur station without an FCC-issued reciprocal permit.   [97.107]

N1B08:
The types of license classes are listed in section 97.9 of the FCC rules.

N1B09:

The Novice and Technician licenses are the entry level licenses. The progression is then General, Advanced and Amateur Extra. [97.9]

N1B10: This question was withdrawn and should not appear in a VE administered test. [97.9]

N1B11:
The Technician Class license does not require a Morse code test. [97.505]

N1C01:

The 80-meter wavelength band is good at night for long range CW contacts. Be sure to note that Novice and Technician class Hams have access to only part of the 80 meter band. [97.301]

N1C02:

The 40-meter band is good at night for long range CW contacts. During the day CW contacts may be made up to 400 miles away. Note Novice and Technician class Hams have access to only part of the 40 meter band. [97.301]

N1C03:

Contacts can easily exceed 3,000 miles on CW using the 15 meter amateur band. Note that Novice and Technician class Hams have access to only part of the 15 meter band. [97.301]

N1C04:

This band is good during the daytime. Notice that the Novice and Technician class have access to only part of the 10 wavelength amateur band. This band is divided into sections. CW is used between 28.1 and 28.3 MHz while telephony is used between 28.3 and 28.5 MHz. [97.301]

N1C05:
This question has been withdrawn.

N1C06:

At these frequencies propagation is normally line of sight. Repeaters are used to extend the range of amateur transmissions. [97.301]

N1C07:

Amateur bands are often referred to in meters of wavelength, even though each band covers a range of wavelengths. This is done for convenience.

If you are given a frequency then the wavelength is found by the equation:
(Wavelength in meters) = 300 / f (MHz).
Where f (MHz) is the frequency in MHz.

If you are given a frequency in kHz then you must first convert it to MHz by dividing by 1000.

To convert a frequency to a wavelength we use the equation:
f (frequency in MHz) = 300 / (Wavelength in meters).

In the question, the frequency is given as 3700 kHz. This converts to 3.7 MHz.
So the wavelength is found by 300 / 3.7 = 81.08 and this is part of the 80 meter band.

[97.301]

N1C08:

The frequency 7125 kHz is the same as 7.125 MHz. Amateur bands are often referred to in meters of wavelength. So, we need to convert 7.125 MHz to wavelength using the equation:

(Wavelength in meters) = 300/f(MHz)

Where f (MHz) is the frequency in MHz.

In this question we have (Wavelength in meters) =300 / 7.125 = 42.1 meters. This is part of the 40 meter amateur band.

[97.301]

N1C09:

Convert 21,150 kHz into MHz by dividing by 1000 to give 21.150 MHz. Amateur bands are often referred to in meters of wavelength. So, we need to convert 21.150 MHz to wavelength using the equation:

(Wavelength in meters) = 300/f(MHz)

Where f (MHz) is the frequency in MHz.

This gives (Wavelength in meters) = 300 / 21.150 = 14.2 meters. This is part of the 15 meter amateur band.

[97.301]

N1C10:

Convert 28,150 kHz into MHz by dividing by 1000 to give 28.150 MHz. Amateur bands are often referred to in meters of wavelength. So, we need to convert 28.150 MHz to wavelength using the equation:

(Wavelength in meters) = 300/f(MHz)

Where f (MHz) is the frequency in MHz.

This gives (Wavelength in meters) = 300 / 28.150 = 10.6 meters. This is part of the 10 meter amateur band.

[97.301]

N1C11:

Amateur bands are often referred to in meters of wavelength. So, we need to convert 223 MHz to wavelength using the equation:

(Wavelength in meters) = 300/f(MHz)

Where f (MHz) is the frequency in MHz.

This gives (Wavelength in meters) = 300 / 223 = 1.34 meters. This is part of the 1.25 meter amateur band.

[97.301]

N1D01:

The rules state that anyone who qualifies by examination is eligible to apply for a station license, except for representatives of foreign governments. [97.5]

N1D02:

No age limits are specified in the FCC rules. Even young children can become operators if they can qualify.

N1D03:

Element 1(A) is the name of the 5 wpm Morse code test. Element 2 is name for the Novice written examination. [97.501]

N1D04:

When you fill out the FCC Form 610 to apply for your amateur operator primary station license, you will have to provide a mailing address. The FCC cannot send your license to you if it does not have it. It is difficult to change your mailing address later so use a permanent one. [97.23]

N1D05:

If you lose your license, write to the FCC for a replacement. The address is: Federal Communications Commission, 1270 Fairfield Road, Gettysburg, Pennsylvania 17325. [97.29]

N1D06:

You will need to fill out an FCC Form 610 if you change your mailing address. Send a COPY of your license to the FCC. [97.23]

N1D07:

US call signs have one or two letters, then a number, then up to three letters.

N1D08:

The first characters of an amateur radio station call sign indicate the country where the station is licensed to operate.   The prefixes to US amateur stations are AA-AL, KA-KZ, NA-NZ, WA-WZ.

N1D09:

The number in the call sign indicates the geographic area of the license. Maps are available showing what numbers are allocated to geographic areas.

N1D10:

Radio amateur licenses last for ten years before they will need to be renewed. There is a two year grace period after license expiration where you can apply for a new one. However, you are not allowed to operate if your license has expired. If you go beyond the grace period, you have to start over and pass all of your examination elements again. [97.21]

N1D11:

You should fill out a form 610 or 610-R up to 90 days in advance for a license renewal. The FCC does not send you a renewal reminder. [97.21]

N1E01:

CW means Morse code. Other names for this type of emission are telegraphy and A1a. On the 80 meter band you may operate telegraphy on 3675-3725 kHz when you gain your Novice class license. [97.305]

N1E02:
As a Novice you may use only Morse code on the 40 meter band (7100-7150 kHz).   [97.305]

N1E03:
As a Novice you may only use Morse code on the 15 meter bend from 21, 100-21,200 kHz. [97.305]

N1E04:

Novices may only use Morse code on the 80 meter band. [97.305]

N1E05:
Novices may only use Morse code (CW) on the 40 meter amateur band. [97.305]

N1E06:
Novices are allowed to use Morse code (CW) only on the 15 meter Amateur band. [97.305]

N1E07:

Novices may transmit data from computers or RTTY (teleprinter messages) between 28.1 and 28.3 MHz. This is in the 10 meter Amateur band. [97.305]

N1E08:

Novices are allowed to send and receive Morse code on the voice portion of 10 meters. They are also allowed to use single sideband telephony on this band. [97.305]

N1E09:
Between 222.1 and 223.91 MHz you may use any permitted emission type. [97.305]

N1E10:
Between 1270 and 1295 MHz you may use any permitted emission type.   [97.305]

N1E11:

The 10 meter band is from 28.3 to 28.5 MHz. This band can offer long distance voice communications to Novices when propagation conditions are good. [97.305]

N1E12:
This question has been withdrawn by the FCC. [97.305]

N1E13:

Novices may transmit and receive radio teletype messages (RTTY) as well as Morse code between 28.1 and 28.3 MHz in the 10 meter amateur band. [97.301]

N1E14:

The frequencies from 28.1 to 28.3 MHz in the 10 meter Amateur band are used for data, packet radio and teleprinter (RTTY) transmissions. [97.3012]

N1F01:
Always use the minimum of power needed to contact another station. [97.313]

N1F02:
All amateur radio operators must stay below 200 Watts PEP output on this band. [97.313]

N1F03:
All amateur radio operators must stay below 200 Watts PEP output on this sub-band. [97.313]

N1F04:
All amateur radio operators must stay below 200 Watts PEP output on this sub-band. [97.313]

N1F05:
Novice class Hams must stay below 200 Watts PEP output on the 10 meter amateur band. [97.313]

N1F06:

Novice class Hams must stay below 200 Watts PEP output on the 10 meter amateur band. [97.313]

N1F07:
On the 1.25 meter amateur band your power output is limited to 25 Watts. [97.313]

N1F08:

On the 1270 MHz microwave band your power output is limited to 5 Watts. Be aware that high microwave power levels can cause heating and severe damage to human tissue. [97.313]

N1F09:

The Novice sub-bands on 80, 40, 15 and 10 meters are restricted to output power levels of 200 Watts PEP. Part of the reason for this is safety. As a Novice you dont want to be handling higher power levels. [97.313]

N1F10:
Novice stations may transmit up to 25 Watts of output power on the 222-225 MHz band. [97.313]

N1F11:

Radio waves with a wavelength of only 23 cm are in the microwave range. Radiation in the microwave range is similar to that used in microwave ovens. The power limit is for the personal safety of Novice operators who may be relatively inexperienced. [97.313]

N1G01:

The control operator is whoever is designated by the licensee (including the licensee herself) to be responsible for station transmissions. [97.3]

N1G02:

The FCC rules state that when the control operator is a different person from the station licensee then both persons are equally responsible for proper station operation. [97.103]

N1G03:

The FCC rules state that when the control operator is a different person from the station licensee then both persons are equally responsible for proper station operation. [97.103]

N1G04:

Both you and anyone else who operates your station are responsible for compliance with FCC rules. [97.103]

N1G05:

As a designated control operator you may only operate within the privileges authorized for your license class.   This is regardless of the license class held by the station licensee.   [97.105]

N1G06:

You do not HAVE to keep a record of who was using your station. However, without any records, the FCC will assume that the licensee was the control operator. [97.103]

N1G07:

The designated control operator may operate only within the privileges authorized for his license class. This is regardless of the license class held by the station licensee. [97.105]

N1G08 :

If you operate another Ham's station, you may operate only with the privileges allowed by your license. This is regardless of the privileges of the station licensee. [97.105]

N1G09:

Every amateur station must have a properly licensed control operator while transmitting [97.7]. Special rules apply to beacon [97.203], repeater [97.205] and space [97.207] station operation.

N1G10:

In the case of locally controlled operation (by the other operator) you must be at the control point [97.109]. Usually this means being in the same room. Special rules apply to beacon [97.203], repeater [97.205] and space [97.207] station operation.

N1G11:
Any control operator for an amateur radio station, including family members, must be licensed. [97.109]

N1H01:

If licensed you may operate an amateur radio station anywhere in the US without notifying the FCC but special rules apply to operation aboard ships and aircraft. [97.11]

N1H02:

The FCC rules list the types of amateur stations with which amateur stations may communicate. Briefly, these are:

Other amateur stations.

Emergency communications with other FCC regulated stations.

Transmissions with US government stations for RACES communications.

Communications with non-FCC regulated stations that are authorized to communicate with amateur stations.

Communications with US military stations during communications exercises.

Brief test transmissions.

Brief transmissions to establish communications.

Command transmissions to automatic devices.

Emergency communications.

Transmissions for the purpose of teaching the Morse code.

Information bulletins.

Telemetry.

[97.111]

N1H03:
Due to rule changes this question was withdrawn by the FCC.

N1H04:
Due to rule changes this question was withdrawn by the FCC.

N1H05:
Due to rule changes this question was withdrawn by the FCC.

N1H06 :
State your call sign regularly. [97.119]

N1H07:
You must always send your own call sign when operating from your station. [97.119]

N1H08:

It is not good practice, but by FCC law you are allowed to operate for up to 10 minutes without identifying yourself. You must identify after 10 minutes or at the end of communication. [97.119]

N1H09:

When you sign off, you must always finish with your call sign. The other station must do this also. [97.119]

N1H10:

US amateur operators may handle third party communications with countries who have a third party agreement. [97.115]

N1H11:

Each amateur must give his authorized call sign at the end of each communication and at ten minute intervals during communication. [97.119]

N1I01:

The third party may also state the message, provided that this is done under continuous supervision by the control operator. [97.115]

N1I02:

A great thing about this hobby is the freedom to speak to radio amateurs anywhere in the world.
[97.111]

N1I03:
Special rules apply to space station operation. [97.207]

N1I04:
Any amateur station may be a space station. [97.207]

N1I05:

If you are employed by an organization that transmits ham radio news bulletins and CW practice transmissions, you may accept compensation or wages. [97.113]

N1I06:

Public broadcasting is not permitted. Dissemination of telegraphy practice sessions and information bulletins of specific interest to radio amateurs is permitted. [97.113]

N1I07:
No music is permitted on ham radio, not even background music.   No exceptions!   [97.113]

N1I08:

Codes designed to obscure an amateur radio message are not permitted. [97.113] Data transmission using specified publicly available codes are allowed. [97.309]

N1I09:

When a third party is stating a message the control operator must always supervise them to make sure that they comply with the FCC rules. Be aware that some countries do not permit third party amateur radio communications. [97.115]

N1I10:

It is the control operator's responsibility to make sure that there is a third part agreement in force at both stations. [97.115]

N1I11:
Lists of countries permitting third party traffic are available. [97.115]

N1J01:

The deliberate production of harmful interference is illegal. [97.3]

N1J02:

Transmitting on any frequency outside the permitted bands is illegal. Transmitting on emergency service frequencies could block emergency communications and cause loss of life. [97.3]

N1J03:

Deliberate interference is illegal and could result in penalties such as permanent revocation of your amateur radio license. [97.101]

N1J04:

False and deceptive transmissions are specifically prohibited. There should never be any reason to do this! [97.113]

N1J05:

The word MAYDAY is used to indicate an immediate and severe risk to life and if used indiscriminately could cause much waste of time by other amateurs and emergency services. [97.113]

N1J06:

You are required by law to identify your station. This shall be done by transmitting your call sign every ten minutes and at the end of the transmission. [97.119]

N1J07:

If you do not identify your station by transmitting your call sign every ten minutes and at end of transmission then you are transmitting unidentified signals. These are prohibited. [97.119]

N1J08:

In a genuine emergency it is permitted to transmit on any frequency. In fact, all the FCC rules can be waived if the emergency is severe enough. [97.405]

N1J09:
This question has been withdrawn due to FCC rule changes. [97.119]

N1J10:

The word MAYDAY is used to indicate an immediate and severe risk to life and if used indiscriminately could cause much waste of time by other amateurs and emergency services. [97.113]

N1J11:

In a genuine emergency it is permitted to transmit on any frequency.   In fact, all the FCC rules can be waived if the emergency is severe enough.   [97.405]

N2A01:

This is polite and avoids possible infringement of FCC rules that call for cooperation in making use of available bandwidth. [97.101]

N2A02:

When you have established initial contact with a station that has a strong signal turn down your power. The other station will hardly notice even drastic reductions and you will be less likely to cause interference to other stations. The reliability of your transmitter may also benefit from running at reduced power.

N2A03:

A dummy load is a resistive device designed to convert most of the RF power from your transmitter into heat. It can be as simple as an electric light bulb, or it may be a sophisticated non-inductive oil cooled affair depending on transmitter frequency and power.

A dummy load temporarily replaces your antenna and allows you to carry out tests without radiating signals. There is usually enough RF leakage from a dummy load and the connecting cables for you to clearly hear the output of your transmitter on a nearby receiver.

N2A04:

Emergency calls have highest priority. Take whatever steps are necessary to provide assistance and alert the emergency services. Remember that the normal FCC rules can be waived in the case of a life threatening emergency. [97.405]

N2A05:

Be sure to send at a speed at which you can comfortably receive because any stations that respond will do so at the same speed.

N2A06:

Always respond at the rate that the sending station is using.   You can agree to speed up when initial contact is established.

N2A07:

Do not transmit Morse code faster than you can receive it else the responding station may reply at a rate you cannot copy.

N2A08:

This is an exciting method to establish contact since you never know what station or stations will respond.

N2A09:

Knowledge of the abbreviations (procedural signals) is important, especially when sending and receiving CW.

N2A10:
K is an abbreviation for over or go ahead.'

N2A11:
Sometimes you may hear a station calling CQ DX.'   This means calling any long distance station.'

N2A12:

You may hear a phrase such as 73 es gd dx de KI5YT when listening to a CW transmission. This is a series of abbreviations that expands to Best regards and hope you work many long distance stations, from station KI5YT.

N2A13:

The RST system is in use by radio amateurs worldwide.
The first digit R indicates readability on a subjective scale of 0 to 5.
The second digit S indicates received signal strength on a scale of 0 to 9.
The third digit T represents CW tone quality and is often omitted with telephony signals.

A phrase such as you are RST 599 here old man means I can read you perfectly, your signal is very strong and your tone quality is perfect.

N2A14:
The RST system is in use by radio amateurs worldwide.
The first digit R indicates readability on a subjective scale of 0 to 5.
The second digit S indicates received signal strength on a scale of 0 to 9.
The third digit T represents CW tone quality and is often omitted with telephony signals.

A phrase such as you are RST 599 here old man means I can read you perfectly, your signal is very strong and your tone quality is perfect.

N2A15:
This is likely to be used by you when starting out on CW!

N2A16:
The phrase QTH here is England simply means I live in England.'

N2A17:

The exchanging of QSL cards with people from other countries is a fascinating branch of the hobby. They come in many colorful designs.

N2A18:
Sometimes you may hear a station calling CQ DX.'   This means calling any long distance station.'

N2A19:

Many amateur radio contacts start off with a CQ call. You may either go on air and call CQ or if you wish you can tune around the bands listening for other stations calling CQ.' It is up to you.

N2A20:

Radio reception may not always be perfect. If someone uses the letter F in a call sign it may sound like a letter S.' There are several other letter pairs that can be confused under less than perfect reception conditions. The Standard International Phonetics alphabet is designed to solve this problem by providing a standard clearly recognized word for each letter of the alphabet. Here is the alphabet:

A	Alfa	H	Hotel	O	Oscar	V	Victor
B	Bravo	I	India	P	Papa	W	Whiskey
C	Charlie	J	Juliet	Q	Quebec	X	X-Ray
D	Delta	K	Kilo	R	Romeo	Y	Yankee
E	Echo	L	Lima	S	Sierra	Z	Zulu
F	Foxtrot	M	Mike	T	Tango		
G	Golf	N	November	U	Uniform		

N2B01:

Typewriter-like machines used to be used for RTTY but nowadays computers are usually used by radio amateurs to receive and send RTTY signals.

N2B02:
When using Baudot TTY codes 45 baud is a RTTY data rate often seen on amateur bands.

N2B03:
Your computer screen will indicate your station's connection status amongst other things.

N2B04:
Listening to other people's traffic is a perfectly acceptable and legitimate practice on all amateur bands.

N2B05:

Whole networks of digipeaters have been set up. This means that packet radio is a communications medium that can rival telephone network based systems for some purposes. Also, use of packet radio does not incur connection charges.

N2B06:
The packet radio network now extends across the entire globe.

N2B07:

In simplex operation both stations use the same frequency and take turns to transmit and receive. Duplex operation involves two frequencies and both stations simultaneously transmit and receive. Simplex operation is the more common method used in amateur radio.

N2B08:

If you do not need the repeater, then changing to simplex mode and speaking directly to the other station allows others to use the repeater.

N2B09:
Repeater operating protocol is different from other modes.

N2B10:

A repeater receives signals on its input frequency and re-transmits them on its output frequency. The difference between input and output frequencies is known as the offset.' For your signals to appear on the repeater output frequency you need to transmit on its input frequency.

N2B11:

A portable or mobile station may be low powered, with an inefficient antenna and be poorly sited. These weak signals from portables and mobiles can be picked up by the sensitive well-sited repeater input. These signals are then amplified and re-transmitted as high power signals, usually from a well-sited high gain antenna.

N2B12:

The difference between repeater input and output is called an offset.' Many amateur radio sets allow for this by automatically offsetting the receive and transmit frequencies. You may have to select the correct offset and frequencies for the individual repeater you are trying to use. Lists of repeater frequencies are published by organizations such as the ARRL.

N2B13:
The calls are subject to all the usual FCC rules regarding content and procedures.

N2B14:

Many amateurs like to rag chew and this is fine. Unfortunately rag chewing over a repeater can block access for other users. Time-out timers prevent occupation for long periods by individual stations.

N2B15:

CTCSS stands for Continuous Tone Coded Squelch System that is used on the VHF bands. This is a sub-audible tone that is mixed in with your transmission. It switches on the audio output of receivers that may be monitoring. It is useful to mute or squelch the audio output of receivers that are used for monitoring purposes to avoid the continuous hiss that would otherwise be heard.

N3A01:

Signals on the VHF and UHF bands travel in straight lines, just like light. Occasionally atmospheric conditions may extend the limit to somewhat beyond the horizon.

N3A02:

Although the signals travel in straight lines, like light, they also reflect off buildings and tall objects. Communication can occur even though the two stations cannot actually see each other.

N3A03:

VHF and UHF radio signals usually travel in straight lines. Some bending can occur under certain atmospheric conditions.

N3A04:

VHF and UHF signals can easily reflect around the structure of a building and find their way out into the open. If you are using a VHF or UHF set in a building you will find that just moving the antenna a few feet will drastically alter reception of stations outside the building.

N3A05:
All stations on all frequencies emit ground waves that can travel up to about 100 miles.

N3A06:

Ground waves have a much shorter range than sky waves reflected off the ionosphere. Ground waves travel for a few hundred miles at most while sky waves can bounce between ground and ionosphere and travel many thousands of miles.

N3A07:
This sky-wave propagation can allow communication right round the planet on some amateur bands.

N3A08:

The ionosphere acts as a mirror to HF radio signals and reflects them back to the ground where they may bounce upward again. This process can continue for thousands of miles.

N3A09:

The ground wave will fade away after 100 miles or so. However, sky wave signals may reach the ground some thousands of miles from the sending station.

N3A10:

The layers of ionized gases high above the earth are called the ionosphere. The ions, or charged particles, are generated by radiation from the sun.

N3A11:

The ionosphere is made up of charged particles caused by solar radiation. When solar activity increases, the ionization will be greater.

N3A12:

The sun goes through its cycle of activity about once every 11 years. At the solar peak reflections from the ionosphere will allow reliable communications around the entire world. At a solar minimum worldwide communications may be more sporadic.

N4A01:

You are responsible for any unauthorized use of your station and must take reasonable steps to avoid this.

N4A02:
The microphone is a visible temptation to anyone looking in your car.   Put it out of sight.

N4A03:

You are responsible for any unauthorized use of your station and must take reasonable steps to avoid this.   A key operated switch is one method.

N4A04:

Your amateur radio antenna may well be the highest point in your locality. A likely target for lightning strikes. Grounding of the antenna cable will not prevent lightning strikes, but will minimize the damage that such strikes cause.

N4A05:

Your amateur radio antenna may be the highest point in your locality. A likely target for lightning strikes. Grounding of the antenna cable will not prevent lightning strikes, but will minimize the damage that such strikes can cause.

N4A06:
Make sure that your set is disconnected from the antenna and unplugged from the power line.

N4A07:

The grounding should be done with thick braid. Good grounding will provide other beneficial effects along with protection from shock. Grounding will give better immunity from interference and reduce spurious transmitted signals.

N4A08:

Connect a common bus bar to a good earth ground such as a water pipe. Then, run copper braid from the chassis of each piece of equipment to the common bar. Make sure that the pipe provides a metallic path all way into the ground and that there are no plastic sections. An alternative to a water pipe is a copper coated grounding rod. If you choose this grounding method, make sure there is sufficient soil moisture in the area of the rod.

N4A09:

Connecting the chassis of each item of equipment to a good ground connection will reduce the chance of electric shock.

N4A10:

The steel provides physical strength while driving the rod into the ground. The copper cladding provides the required high electrical conductivity.

N4A11:
Eight feet is a minimum for the rod.

N4B01:

Concentrated microwave radiation is harmful to human tissue. The delicate tissues in the eyes are especially susceptable. Keep your face away from the antenna and waveguide feeds. Do not put your face near the open end of a waveguide when RF power is present.

N4B02:

All antennas can be dangerous when you are transmitting. Local heating effects as well as RF burns can cause serious injury.

N4B03:

All high voltage equipment must be treated with respect. High power UHF and microwave devices carry additional hazards since the RF energy can cause local heating within human tissue.

N4B04:

Coaxial cable intended for use at lower frequencies such as VHF television antenna feeds can exhibit high losses at UHF. For transmitters this results in wasted power and possible overheating of the cable. On the receiving side the result will be a loss of weak signals.

N4B05:

You dont want your head exposed to high levels of RF energy.   UHF radiation is considered to be especially harmful.

N4B06:

Microwave oven radiation resembles radiation in the 1270 MHz amateur band. Even though Novices are limited to 5 Watts this power can be concentrated into small areas and result in severe injury. Do not look down waveguides if there is any chance that RF power can be present!

N4B07:

Most high voltage equipment has automatic interlocks that disconnect the supply when the lid is removed. The interlock may also place a short circuit across high voltage rails to make sure that electrical energy stored in filter capacitors is discharged.

N4B08:

Make sure that the belt is fit for the purpose and carefully examined. Utility companies using safety equipment such as safety belts have procedures to make sure that all equipment is examined regularly.

N4B09:

Just think what a fall from 20 feet would be like, even if you didnt get hit by something on the way down. Did that thought make you shudder?   Good, you will remember the advice to wear a properly checked safety belt.

N4B10:

You will want to have your antenna as high as possible to get the best range. This is especially important at frequencies of 28 Mhz and higher.

N4B11:
This is the reason that construction workers and anyone else on construction sites wear hard hats.

N4C01:

Standing wave ratio is a measure of power going away from the transmitter compared with power going back to the transmitter. A ratio of 1:1 shows that no power is being reflected back to the transmitter by the antenna. SWR meters have an upper frequency limit. Those that work at 30 MHz and below are fairly inexpensive. As the maximum working frequency of the meter increases, so does the cost. A standing ratio of more than about 1:1.5 suggests that you have a problem with your antenna or antenna feed. A value less than this suggests that most of the transmitter power is being transferred to the antenna. Of course, there are several other factors that will also determine the effectiveness of your antenna.

N4C02 :

The relative impedance match is a measure of how effectively power is transferred. We speak of a good impedance match when most power is transferred.

N4C03:

This is the best place to measure standing wave ratio of your antenna since the effect of the antenna feeder is eliminated. In practice, many amateurs take this measurement at the input to the feedline. This is because the antenna may not be easily accessible.

N4C04:

A 1:1 SWR is a perfect match; all the output power is being transferred to the antenna feeder. It is possible that much of this power is being converted to heat in a lossy feeder or inefficient antenna. A good SWR reading is only one of several requirements for an effective antenna.

N4C05 :

This represents a reasonable impedance match. Most of the transmitter power is being transferred; only a small fraction is being reflected back to the transmitter by the load. A good SWR reading is only one of several requirements for an effective antenna. An efficient dummy load should give a perfect match and yet will radiate very little of the RF power.

N4C06:
A 4:1 reading is a sure sign that something is wrong.   Either the feeder, antenna or SWR meter is faulty.

N4C07:

Once a transmission starts the SWR reading should be constant. Erratic readings show that a bad connection exists somewhere in your antenna system. You may notice that the changes occur more in windy weather or when you rotate your antenna. This could indicate that nearby objects such as trees are affecting the performance of your antenna. The remedy is to either remove the objects or relocate your antenna.

N4C08:

Or the antenna is too close to other objects such as trees, buildings or power lines. You should never contemplate erecting an antenna tower anywhere near power lines for safety reasons.

N4C09:

Ideally the SWR should rise very slightly as each band edge is approached. If the SWR rise is greater at the higher frequency end then it is too long. Shorten it.

N4C10:

Ideally the SWR should rise very slightly as each band edge is approached. If the SWR rise is greater at the lower frequency end then it is too short. Lengthen it.

N4C11:
For UHF measurements you must use a specially designed SWR meter.

N4D01:

A high pass filter installed at the antenna input of a television may help to reduce interference (TVI) caused by a strong signal from a nearby amateur radio transmitter transmitting on HF. It is up to the owner of the television set to fit the filter. A high pass filter allows the VHF television signals to pass, but not your HF signals.

N4D02:

Front-end overload is cause by the strong signal from a transmitter swamping the sensitive aerial input circuitry of the television. Televisions are generally not designed to work in near powerful transmitters. One way to reduce front end overload in nearby televisions is to site your antenna as far away from them as possible. One way to reduce the problem when transmitting on HF is for the owner of the television to connect a high pass filter to the antenna input of his television set.

N4D03:

Television Receiver overload may be reduced by keeping your transmitting antenna as far away from your neighbors television antennas as possible. Another way to reduce the problem when transmitting on HF is for the owner of the television to connect a high pass filter to the antenna input of his television set. You might offer to fit the filters for your neighbors. Remember though, reduction of front-end overload is the responsibility of the television set owner. Dont overlook the possibility of reducing your transmitter power. This can sometimes drastically reduce the problem and the loss of transmitter range may be quite small.

N4D04:

If the interference is frequency sensitive then is probably harmonic interference. Harmonics are low level spurious emissions from your transmitter at multiples of your intended transmit frequency. It is your responsibility to ensure that radiation of harmonics is kept to a minimum. If you are transmitting on HF then you could try adding a low pass filter to the antenna feed of your transmitter. Older style tube type transmitters can emit high levels of harmonics if they are not tuned properly.

N4D05:

A high pass filter will allow the VHF television signals to pass through, but will stop the lower frequency HF signals from your transmitter.

N4D06:

Low pass filters are designed only for HF transceivers used up to 30 MHz, the 10 meters amateur band. If you try to use one with a VHF or UHF set then no RF energy will get to your antenna. Furthermore, this may damage the filter or your transmitter.

N4D07:

Harmonics will always be produced in the circuitry of your transmitter. They are reduced to low levels before they appear at the antenna output, but can still affect users of other services. An amateur transmission on 28 MHz will have low level harmonics at:

56 MHz, the second harmonic. This is can be a problem because television sets receive at around this frequency.

84 MHz, the third harmonic can affect services using this band.

Further harmonics occur at 112 MHz, 140 MHz and so on.

N4D08:

Modern transmitters will contain harmonic suppression. You may further reduce the level of harmonic radiation by adding a low pass filter to your transmitter antenna feed.

N4D09:

Modern transceivers do not require power amplifier tuning. Older tube type transmitters require careful tuning to minimize harmonic radiation. The problem is worse if you have a multiband antenna that is efficient at both its intended frequency and at a harmonic of this frequency.

N4D10:

If you operate a transmitter with the metal cover removed there will spurious RF radiation from the exposed components. There may also be a safety hazard due to high RF field strength and high voltages.

N4D11:

It is always a good idea to check out interference problems on your own television set first. This is likely to be the closest one to your transmitter. Some amateurs have a television set in the shack that is dedicated to monitoring for interference problems.

N5A01:

One megahertz (1 X 106) is equal to 1000 kHz. To convert kHz to MHz move the decimal point three places to the left. To convert MHz of frequency to meters of wavelength divide 300 by the frequency in MHz.

N5A02:

Multiply by 1000 to convert MHz to kHz. This is the same as moving the decimal point three places to the right.

N5A03:
1 kilo hertz is the same as 1000 hertz.   Hz is short for hertz, which means cycles per second.'

N5A04:

One hundred centimeters is 1 meter. Divide a distance in centimeters by 100 to get the distance in meters. A meter is just over 3 feet.

N5A05:

Milli means a thousandth. One milli-Ampere is one thousandth of an Ampere so you divide milliAmperes by 1000 to get Amperes. (Amperes are usually called Amps.)

N5A06:

Milli means a thousandth. One milli-Volt is one thousandth of a Volt. You divide millivolts by 1000 to get Volts.

N5A07:

Micro means one millionth.   To get microfarads to farads you divide by 1,000,000.   An easy way to do this is to move the decimal point six places to the left.

N5A08:
Micro means one millionth.
Pico means a millionth of a millionth.
To get from pico to micro we divide by 1,000,000.

N5A09:
Kilo means one thousand.   1 kilo hertz is 1000 hertz.

N5A10:
Kilo means one thousand.   1 kilo hertz is 1000 hertz.
Mega means one million.   1 mega hertz is 1,000,000 hertz.
So there are 1000 kilo hertz in 1 mega hertz.

N5A11:
Milli means one thousandth.
There are 1000 milli Watts in 1 Watt.
To get from milli watts to Watts we divide by 1000.
So 500 Milliwatts is 500/1000 = 0.5 Watts.

N5B01:
Think of the flow of electrons as the flow of water in a pipe.

N5B02:

The flow of electrons in a conductor is called the current and it is measured in Amperes.   Amperes are often called Amps.

N5B03:

Think of water flowing through a pipe. There must be a pressure causing the flow. The electrical pressure that causes electrical current flow is called voltage or electromotive force.

N5B04:
The voltage that pushes the current round an electrical circuit is measured in Volts.

N5B05:
Automobile batteries have 12 Volts between the terminals.

N5B06:

The voltage coming from a wall outlet in the United States is 120 Volts. Be careful when taking amateur equipment abroad. As well as having different outlet fittings the outlet's voltage can be different. For example in Britain a wall outlet will supply 240 Volts!

N5B07:

A good conductor is one that easily allows an electrical current to flow through it. We use good conductors for wire. A good insulator will not easily allow an electrical current to flow though it. We often surround wire with insulation to make sure the current stays in the wire and doesnt leak into surrounding objects.

Copper is a good electrical conductor, which is why most wire is made from copper. Silver is even better and silver wire is occasionally used where very good conduction is required, for example in some UHF radio equipment.

Some relays use gold or silver contacts.

Aluminum is a good conductor, but it is difficult to make good connections to it because of a thin surface insulating layer that quickly forms when exposed to air.

Mica is a very good insulator.

Wood and paper are good insulators if they can be kept dry.

N5B08:

Insulators will not easily allow electrical currents to flow. All metals are electrical conductors. Some metals are better conductors than others. Copper is a good electrical conductor, which is the same as saying it is a very poor insulator. Aluminum is a good electrical conductor. Carbon is rather unusual; it is not a metal but most forms of carbon will conduct electricity.

N5B09:
An insulator has a very high resistance and so electricity cannot flow easily through it.

N5B10:

Imagine a thin pipe with water flowing through it. The flow of the water will be hindered by friction with the walls. A similar thing happens with the flow of electric current; all normal materials offer some resistance to flow. Certain materials that offer high resistance are incorporated into electronic components called resistors.

N5B11:

All normal materials offer resistance to the flow of electrical current. The basic unit of electrical resistance is called the Ohm.

If one Volt of electrical pressure is applied to a circuit and one Ampere of current flows then the circuit has one Ohm of resistance. This statement is the basis of Ohms law.

N5C01:

The relationship between voltage current and resistance is called Ohms law. You need to be familiar with this simple law:

E = I x R.

Where:
E is voltage measured in Volts.
I is current measured in Amperes.
R is resistance measured in Ohms.

N5C02:

According to Ohms law:

E = I x R.

Where:
E is voltage measured in Volts.
I is current measured in Amperes.
R is resistance measured in Ohms.

In the question we have:

E = 2 Amperes x 50 Ohms = 100 Volts.

N5C03:

The Ohms law equation relating voltage current and resistance is:
E = I x R.

Where:
E is voltage measured in Volts.
I is current measured in Amperes.
R is resistance measured in Ohms.

And so we have:
200 Volts = I Amperes x 100 Ohms.

To balance both sides of the equation I must be 2 Amperes.

N5C04:
The Ohms law equation relating voltage current and resistance is:
E = I x R.

Where:
E is voltage measured in Volts.
I is current measured in Amperes.
R is resistance measured in Ohms.

And so we have:
90 Volts = 3 Amperes x R Ohms.

To balance both sides of the equation R must be 30 Ohms.

N5C05:

Power is the rate at which energy is being transferred.   A high power transmitter is transferring a lot of energy to the antenna.

N5C06:

A high power light bulb is transferring more electrical energy into heat and light than a low powered bulb. Electrical power is measured in Watts.

N5C07:

Power is the rate at which energy is being transferred. It is measured in Watts. If 1 Ampere of current is flowing and the electrical force is 1 Volt then the power is 1 Watt. Here is how to calculate power:

$P = V \times I$.

Where P is power in Watts.
V is voltage in Volts.
I is current in Amps.

N5C08:

Imagine an open circuit as a gap that has opened up in the circuit and so no current can flow around it. The circuit will not function.

N5C09:

Imagine an electrical circuit that performs some function. Now an extra piece of wire is added so that the current can take the easy or short path instead of performing its function.

N5C10:

Batteries always generate direct current.   There will be a positive terminal and a negative terminal.

N5C11:

Alternating current changes direction a specified number of times every second. The power supply to homes in the US is alternating current that changes direction 60 times every second.

N5D01:

Frequency is measured in hertz. The frequency of an ac (alternating current) supply is the number of times per second that the direction changes.

N5D02:

The unit of frequency is the Hertz.   A current that changes direction 60 times every second has a frequency of 60 hertz.

N5D03:

This figure is for young people. As we get older the upper limit reduces. Exposure to loud machinery or heavy-metal rock music is believed to accelerate high frequency hearing loss.

N5D04:
Audio frequencies are those that people can hear; they are audible!

N5D05:
A way to remember this is that radio frequencies start where audio frequencies end, at 20 kHz.

N5D06:
This is way above the 20 kHz point and so it is in the radio frequency range.

N5D07:

The phrase 'Cycles per second' means the same as frequency in hertz, or Hz. The question also tests that you understand that kilo means thousands.

N5D08:

Imagine a wave traveling in water. Count how many peaks pass you every second. This is the frequency. Now measure the distance between the peaks. This is the wavelength.

N5D09:

Imagine a wave traveling in water. Count how many peaks pass you every second. This is the frequency. Now measure the distance between the peaks. This is the wavelength.

If a lot of peaks go past every second then they are close together and the wavelength is small.

N5D10:

Imagine a wave traveling in water. Count how many peaks pass you every second. This is the frequency. Now measure the distance between the peaks. This is the wavelength.

If only a few peaks go past every second then they are far apart; the wavelength is large.

N5D11:
60 Hz means the same as 60 cycles per second.

N6A01:

With switches the throw is the number of outputs, while the pole is the number of individual switching elements.

A single pole double throw switch switches one input (via the pole) to one of two outputs (the throws).

N6A02:

With switches the throw is the number of outputs, while the pole is the number of individual switching elements.

It is double pole and so can handle two inputs. It is single throw, so each input has a single output to which it is either connected or not.

N6A03:

A battery has a positive and a negative terminal. The other components do not need to be connected in any particular polarity.

N6A04:

A potentiometer (pot) is a type of variable resistance often used in electronic equipment. An example is the volume control found in radio and audio equipment.

N6A05:
In schematic diagrams an arrow often indicates a component with a variable value.

N6A06:

The jagged bends might remind you of a road that is difficult to negotiate. The cars must travel more slowly. A resistor presents electrical resistance and slows down the current.

N6A07:

A fuse is a component that is designed to open the circuit if too much current flows. Fuses are safety devices that prevent damage or fire elsewhere in an item of equipment. Fuses are rated to blow at various currents. Make sure that replacement fuses have the correct rating. Many fuses are small tubular glass or ceramic devices with a metal cap at each end. They look like the diagram.

N6A08:

The dissimilar parallel lines represent the plates in a lead-acid cell that are dissimilar when charged. You have to imagine the electrolyte that is between them!

N6A09:
A single-pole, single-throw switch is a simple on/off switch.

N6A10:

This switch is useful for routing an input to either of two outputs. You may wish to route the RF from your transmitter to two different antenna systems depending on the band you are using.

N6A11:

This sort of switch is often used to switch power to a shack. It disconnects both conductors of the power feed when in the off position.

N6A12:
This switch could be used to route a single power feed to two pieces of equipment at different times.

N6B01:
A transistor can amplify small signals using a low voltage power supply.

N6B02:

A transistor has an emitter, collector and base. An NPN transistor has to have the emitter negative and the collector positive. A PNP transistor has a positive emitter and negative collector.

N6B03:
The same antenna can radiate energy from a transmitter and collect energy for a receiver.

N6B04:

This symbol looks a bit like a plant pot containing earth. The symbol represents a connection to the Earth. One way to obtain this is by connection to a grounding rod hammered into the soil.

N6B05:

A chassis ground is indicated by this symbol. A chassis ground is a connection to the metal chassis of an item of electronic equipment. (Which may, or may not, be connected to an earth ground.)

N6B06:
Imagine three conductors pointing upwards, like an antenna.

N6B07:

In symbols 2 and 3 the internal parts are not touching. They have a vacuum between them and must be vacuum tubes. The transistors are symbols 1 and 4. Look at the arrows in the transistor symbols. A pointing in arrow is a PNP transistor, so the correct answer for this question is symbol 4.

N6B08:

In symbols 2 and 3 the internal parts are not touching. They have a vacuum between them and must be vacuum tubes. The transistors are symbols 1 and 4. Look at the arrows in the transistor symbols. A pointing in arrow is a PNP transistor, so the correct answer is symbol 1.

N6B09:

In symbols 2 and 3 the internal parts are not touching. They have a vacuum between them and must be vacuum tubes. The triode has three elements on the inside (tri- meaning three of).

N6B10:

The good old vacuum tube is still needed for high power RF amplifier circuits. However, solid state RF amplifiers are gaining ground.

N6B11:

Tubes require relatively high voltages for their operation. Where a transistor will typically require a power supply of 9 Volts an equivalent vacuum tube might require 200 Volts. High power tubes can require 2000 Volts or more!

N7A01:

We use an antenna switch. This could well be a single pole double throw switch incorporated into an electrically operated relay. Antenna switches designed for HF use may give high losses at VHF and UHF. Make sure your antenna switch is designed for the power and frequencies you will be using.

N7A02:

An antenna tuner can be used as a matching device to maximize the amount of RF power transferred to the antenna. You determine best match condition using a SWR meter.

N7A03:
Coaxial cable carrying RF from your transmitter to your antenna is often referred to as feedline.

N7A04:

An SWR meter can show if a fault is developing in your antenna systems by monitoring the SWR. An unexplained increase would alert you to a bad connection developing in the system.

N7A05:

The SWR meter can go between your transceiver and an antenna tuner or an antenna switch to monitor for faults developing in the antenna system.   It will also provide a check that the antenna tuner is doing a proper job of matching your transmitter and antenna system.

N7A06:

A receiver will have sensitive components connected to the antenna input. Any transmitter will be capable of delivering signals millions of times more powerful than the receiver is designed to handle. Permanent damage will be the most likely result, even if the power is not switched on to the receiver.

N7A07:

Your car will provide a 12 Volt DC supply.   Your home will have a 120 Volt ac supply.

N7A08:

An antenna tuner is designed to allow a transmitter to transfer maximum power into an antenna that may not otherwise be a good match.

N7A09:

This diagram shows a typical setup that allows the transmitter output to be temporarily diverted into a dummy load for test purposes. Tests can then be carried out without the possibility of spurious signals being radiated.

N7A10:

Block one is the transceiver connected to block two, which is an SWR meter. Then, block three is the antenna switch. The antenna switch is used to select the correct antenna or dummy load.

N7A11:

Block three is an antenna tuner, used to match the transmitter to the antenna. Of course, an SWR meter could be placed in this position, but this option was not presented.

N7A12:
The 120 Volt AC supply in your home is unsuitable for powering mobile rigs or charging batteries.

N7A13:

A transceiver designed to output several hundred Watts of power must get this power from the power supply.

N7B01:
To send Morse code a telegraph key is required.

N7B02:
The Morse code telegraph key plugs in to special socket on your transceiver.

N7B03:
An electronic keyer gives perfect dits and dahs.

N7B04:
The microphone plugs in a special socket on your transceiver.

N7B05:
To transmit telephony you need a microphone.

N7B06:

Computer systems are now more common than mechanical teleprinters. Kits and suitable software are readily obtainable to allow easy connection of a computer to your transceiver.

N7B07:

The purpose of the modem is to convert the signals from the format used by a computer into audio signals that can be accepted by your transceiver. Kits and suitable software are readily obtainable to allow easy connection of a computer to your transceiver.

N7B08:

In packet radio operation, messages are assembled into packets. Each one has address information added. The terminal node controller (TNC) is used to assemble and disassemble these packets of information.

N7B09:

The terminal node controller functions as an interface between your computer and your transceiver. If you have a PC there are plug-in TNCs available.

N7B10:
To operate RTTY you need a transceiver and a radio-teleprinter or computer.

N7B11:

The terminal node controller functions as an interface between your computer and your transceiver. If you have a PC there are plug-in TNCs available.

N8A01:

The RF signal is switched on and off by operating the telegraph key. When the signal is on, it produces a plain continuous signal or continuous wave. Hence, the alternative term for Morse code transmission is 'CW'.

N8A02:
The frequency of the signal is shifted slightly as the letter codes are sent.

N8A03:

CW stands for Continuous Wave. In Morse code, each DIT and DAH consists of a plain continuous signal. The signals are sent for a short period of time.

N8A04:
RTTY stands for radioteletype.

N8A05:
The digital data from a computer is packaged up into packets before being transmitted.

N8A06:
Phone, or telephony, is another name for voice communications.

N8A07:
All modern commercial transceivers have built-in key click filters.

N8A08:

Chirp is a characteristic sound made by transmitters with poor power supplies. It is heard as a change or wobble in frequency at the start of each dit or dah.

N8A09:

Chirp is a characteristic sound made by transmitters with poor power supplies.   It is heard as a change or wobble in frequency at the start of each dit or dah.

To correct the power supply problem you:

a) Cure the fault if the power supply is of the correct rating for your transceiver.

b) Get a power supply that is capable of providing sufficient power for your transceiver

c) In the case of battery powered equipment, make sure that the batteries are charged.

N8A10:

Old style power supplies used filter capacitors to clean up the DC power supply to a transmitter. These capacitors contained a liquid that could gradually dry out over the years and they would lose their function. The result was a harsh 60 hertz buzz superimposed on the transmitter signal. Modern power supply circuits do not use these 60 hertz filter capacitors.

N8A11:

By convention upper side band (USB) is used on 10 meters, 12 meters, 15 meters and 20 meters. Lower sideband (LSB) is used on 40 meters, 80 meters and 160 meters.

N8B01:

Harmonic frequencies are always multiples of the desired fundamental frequency. They are spurious emissions and need to be kept at low levels in the output of a transmitter.

N8B02:

Harmonic frequencies are always multiples of the desired transmitted signal frequency. In this case 7160 kHz x 4 = 28,640 kHz.

N8B03:

Since 7,125 kHz x 3 = 21,375 the two frequencies are harmonically related. One is a multiple of the other.

N8B04:
Your hand held may be faulty if it is radiating signals other than the intended one.

N8B05:
If it is radiating signals other than the intended one they are spurious emissions.

N8B06:

The cover and shielding are intended to prevent internal transmitter components from radiating spurious emissions. They are also there to prevent exposure to hazardous voltages and high levels of RF radiation.

N8B07:

Splatter has a characteristic sound. A signal with splatter is taking up more band space than necessary as well as advertising the fact the station is being operated incorrectly. Read your transceiver operating instructions to learn how to adjust your microphone gain setting so as not to cause splatter.

N8B08:

A speech processor can be useful to enhance your speech signals. If too much speech processing is used the result will be a broadening of your signal called splatter. Splatter has a characteristic sound. A signal with splatter is taking up more band space than necessary as well as advertising the fact the station is being operated incorrectly. Read your transceiver operating instructions to learn how to adjust your speech processor so as not to cause splatter.

N8B09:
On commercial FM equipment there is usually no microphone gain control.

N8B10:
Always speak in a normal voice with the microphone held about an inch away from the mouth.

N8B11:

Deviation is the amount that your speech is affecting the RF signal of an FM transmission. Talk farther from the microphone to reduce deviation.

N9A01:
The thing to watch for here is that the length is required in feet, not meters.

Half wave dipole length (feet) = 468 / Frequency (MHz)

Halfwave dipole length (meters) = 150 / Frequency (MHz)

N9A02:
A quarter wave antenna is half as long as a halfwave dipole.

Quarter wave antenna length (feet) = 234/frequency (MHz).

Quarter wave antenna length (meters) = 75/frequency (MHz).

N9A03:

The formula for calculating the length of a half wave dipole is:

Half wave dipole length (feet) = 468 / Frequency (MHz).

The frequency given in the question is in kHz, so the first thing to do is to convert this to MHz as required by the formula. We do this by dividing by 1000:

3725 kHz = 3.725 MHz.

We can now plug this value into the formula:

Half wave dipole length (feet) = 468 / 3.725 = 126 Feet (approximately).

A half wave dipole is easy to make. Just suspend the required horizontal length of ordinary wire as high as you can get it with the ends insulated. Connect your antenna feedline to the center of this antenna.

N9A04:
The required length is in feet so we use the formula:

Half wave dipole length (feet) = 468 / Frequency (MHz).

Plug the frequency into the formula to give:

Half wave dipole length (feet) = 468 / 28.150 MHz = 17 Feet (approximately).

N9A05:
A quarter wave antenna is half as long as a halfwave dipole.

Quarter wave antenna length (feet) = 234/frequency (MHz).

The frequency given in the question is in kHz, so the first thing to do is to convert this to MHz as required by the formula.   We do this by dividing by 1000:

7125 kHz / 1000 = 7.125 MHz.

Plug the frequency into the formula to give:

Quarter wave antenna length (feet) = 234/ 7.125MHz = 33 feet (approximately).

N9A06:
A quarter wave antenna is half as long as a halfwave dipole.

Quarter wave antenna length (feet) = 234/frequency (MHz).

Plug the given frequency into the formula to give:

Quarter wave antenna length (feet) = 234/ 21.125 MHz = 11 feet (approximately).

N9A07:
We use the formula:

Half wave dipole length (feet) = 468 / Frequency (MHz).

Plug the frequency into the formula to give:

Half wave dipole length (feet) = 468 / 223 MHz = 2.1 feet (approximately).

However, the question asks for the length in inches.   So we need to multiply the feet by 12:

2.1 x 12 = 25 approximately.

N9A08:
Use the formula for a half wave dipole:

Half wave dipole length (feet) = 468 / Frequency (MHz)

Try putting in some different frequencies. You will see that the bigger the frequency the smaller the length and vice versa. The same thing happens with all the other antenna length equations. Try it!

N9A09:
Use the formula for a half wave dipole:

Half wave dipole length (feet) = 468 / Frequency (MHz).

Try putting in some different frequencies. You will see that the bigger the frequency the smaller the length and vice versa. The same thing happens with all the other antenna length equations. Try it. So if you remove the tip of an antenna to make it shorter its resonant frequency will increase.

N9A10:
Use the formula for a half wave dipole:

Half wave dipole length (feet) = 468 / Frequency (MHz).

Lets try putting in some frequencies:

At 28.150 MHz the length is 468/28.150 MHz = 16.6 feet.

At 28.000 MHz the length is 468/28.000 MHz = 16.7 feet.

The longer antenna corresponds to the lower frequency. To lower the resonant frequency of an antenna you have to add to its length. This is the reason why VHF antennas are small compared to HF antennas, they work at much higher frequencies.

N9A11:
Use the formula for a half wave dipole:

Half wave dipole length (feet) = 468 / Frequency (MHz).

Lets try putting in some frequencies:

At 28.150 MHz the length is 468/28.150 MHz = 16.6 feet.

At 28.300 MHz the length is 468/28.300 MHz = 16.5 feet.

The shorter antenna corresponds to the higher frequency.   To raise the resonant frequency of an antenna you have to shorten it.

N9B01:

A Yagi antenna consists of a set of parallel dipoles with slightly varying lengths. Many television aerials are Yagi type antennas. One of the conductors, called the driven element, is fed by RF energy from a transmitter. The design and theory of the Yagi antenna are complex. However, these antennas can be bought ready made or built using readily available instructions.

N9B02:

The Yagi antenna is a series of parallel dipoles. The reflector is a little longer than the driven element the directors are shorter. The design and theory of the Yagi antenna are complex. However, these antennas can be bought ready made or built using readily available instructions.

N9B03:
The driven element is fed with RF energy from the transmitter.

N9B04:

The director is shorter than the driven element and is placed in front of it. Most of the transmitted signal goes in the direction of the director.

N9B05:

A reflector is longer than the driven element, most of the transmitted signal goes in a direction away from the reflector.

N9B06:

Most of the radio energy goes in a direction from the reflector toward the director. The reflector is the longest element, the director(s) the shortest.

N9B07:

An antenna does not have to be a half or quarter wavelength long to be effective. In this question the advantage of a 5/8 wavelength antenna is highlighted.

N9B08:

With a quarter wave vertical antenna most of the radiation is horizontal. Very little radiation goes straight up.

N9B09:

If the dipole is erected in the east to west direction, the RF radiation goes mainly north and south.
Many radio amateurs have some means of rotating their antennas to make use of the directional effects.

N9B10:

Although these sets may only radiate a few Watts this power could be hazardous if concentrated near the eyes or head. Keep it away!

N9B11:

You will want to get your antenna as high as possible for maximum effectiveness as well as safety. Besides RF burns caused by electrical arcing, RF energy can damage tissue deep in the body if the power is sufficiently concentrated.

N9C01:

Coaxial cable comes in many different grades. Make sure that you use the correct grade. For example VHF antenna cable for television use will not be adequate for UHF work. The use of inadequate coaxial cable will result in loss of RF power before it can reach your antenna. There will also be some loss of received signals.

N9C02:

There is no RF radiation present on the outside of good quality coaxial cable. You can run it close to building structures without affecting the performance.

N9C03:
Make sure that the cable is sufficiently moisture proof and make sure that it cannot be cut or dug up!

N9C04:
The outer shield of coaxial is at ground potential and so it is OK to run it close to metal or other objects.

N9C05:

Parallel conductor line is a balanced feeder. Your transmitter's output will be unbalanced which means that a special matching device must be used between the transmitter and a parallel conductor line. Another disadvantage is that it must not be run too close to other objects.

N9C06:

Parallel conductor line has very low loss because the medium separating the two conductors is mostly air that does not absorb RF energy.

Operating at a high SWR can heat up and damage coaxial cable; this is less likely with parallel conductor feed-line.

N9C07:

Parallel conductor feedline cannot be used close to metal objects. You will often see it strung on plastic rods held well away from roofs and guttering.

You will need an antenna tuner to match the impedance of 300 Ohm parallel conductor feedline to the 52 Ohm impedance output of your transmitter.

N9C08:

It is not very popular nowadays, even though it has very low loss. Coaxial cable is preferred because it can be run close to other objects and it is weatherproof.

N9C09:
Many radio amateurs use an impedance matching device to match the antenna to the transceiver.

N9C10:

Coaxial cable is unbalanced. The two conductors (inner and shield) are not identical. A dipole antenna is a balanced device, the two halves are identical. A balun is often used to efficiently transfer RF energy from an unbalanced coaxial feedline to a balanced dipole.

N9C11:

Coaxial cable is unbalanced; the two conductors (inner and shield) are not identical. A dipole antenna is a balanced device, the two halves are identical. A balun is often used to efficiently transfer RF energy from an unbalanced coaxial feedline to a balanced dipole.