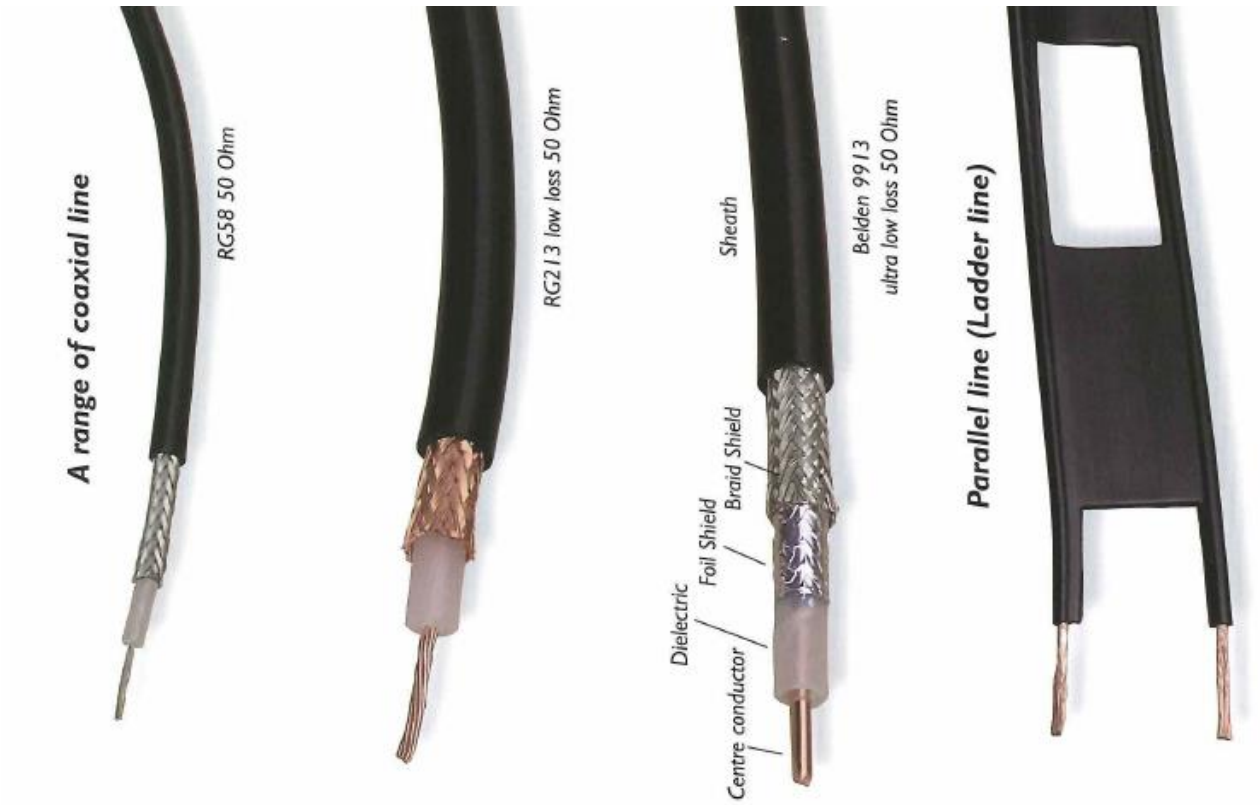
FOUNDATION PRACTICAL ASSESSMENT MATERIAL

1. Identification of common transmission lines types

Using physical examples or photographs or diagrams of common coaxial and parallel transmission lines provided to candidate. Identify correctly three types of transmission lines as coaxial or parallel line. Codes [e.g. RG58] are not required.



2. Identify balanced and unbalanced transmission line

Using physical examples or photographs or diagrams of common coaxial and parallel transmission lines provided to candidate. At least one type of transmission line must be balanced and the other unbalanced. Identify the types of transmission line as balanced or unbalanced.

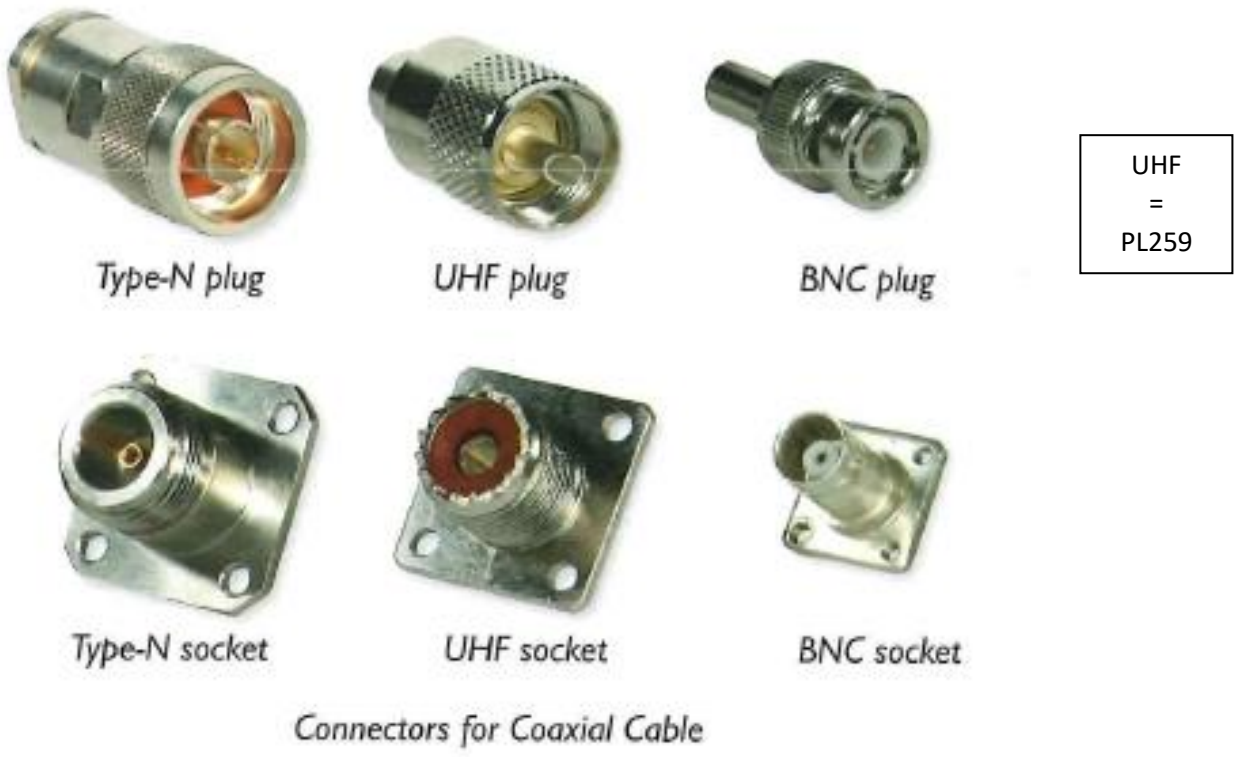
The difference between ideally operating ‘Balanced’ and ‘Unbalanced’ RF Feedlines lies in the system voltages, rather than currents. "Balance is referenced to voltage, not current, in an ideal system."

50-Ohm and 75-Ohm Coaxial Cable are **'Unbalanced’** RF Feed Lines and they have significantly different voltage from each conductor to ground.

300-Ohm Twin-Lead Ribbon Cable, 450-Ohm Ladder Line and 600-Ohm Open Wire Line are **‘Balanced’** RF Feed Lines and if "perfectly" operating they have equal and opposite voltages.

3. *Identification of common coaxial connectors*

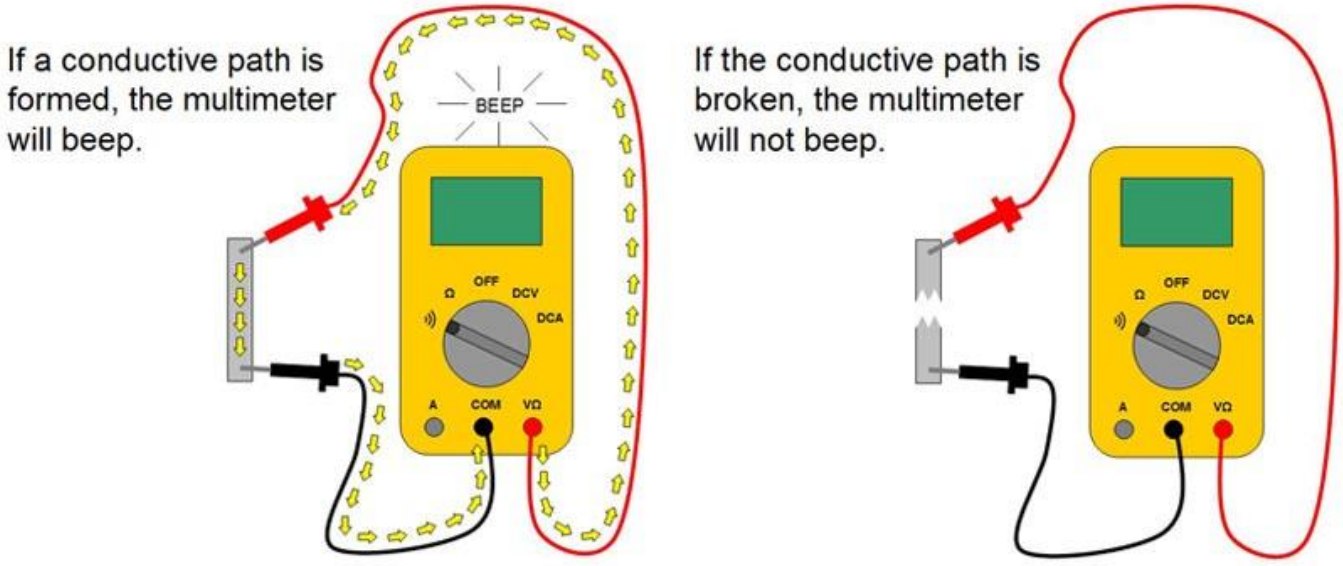
Using physical examples or photographs or diagrams of 3 types of coaxial connector. Identify at least two of the three types present. Example PL-259, BNC, N-Type.



UHF
=
PL259

4. *Demonstrate how to conduct a continuity check on a coaxial cable which is terminated with RF connectors on both ends*

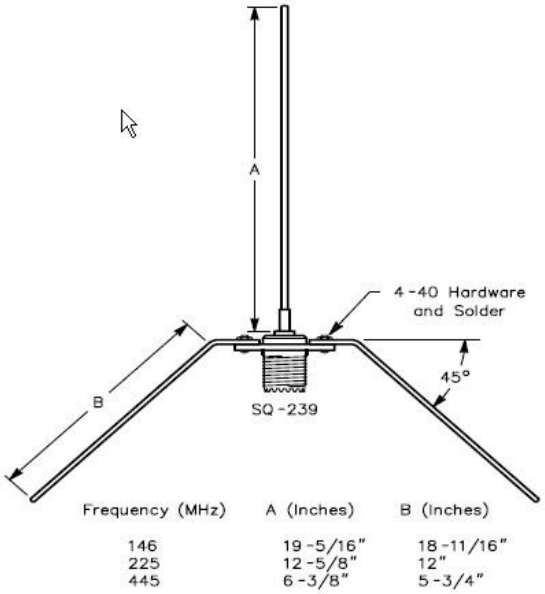
Physical skill test using a provided Ohmmeter and terminated coaxial cable or oral questions and response on how the test procedure would be conducted and results interpreted. Using an Ohmmeter: Low loop resistance test with one end short circuited and high resistance open circuit test or oral description of the test and interpretation of results of test.



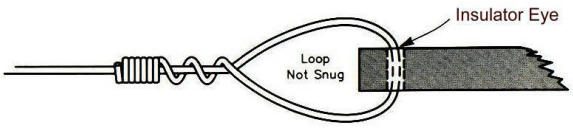
5. *Identify Antennas*

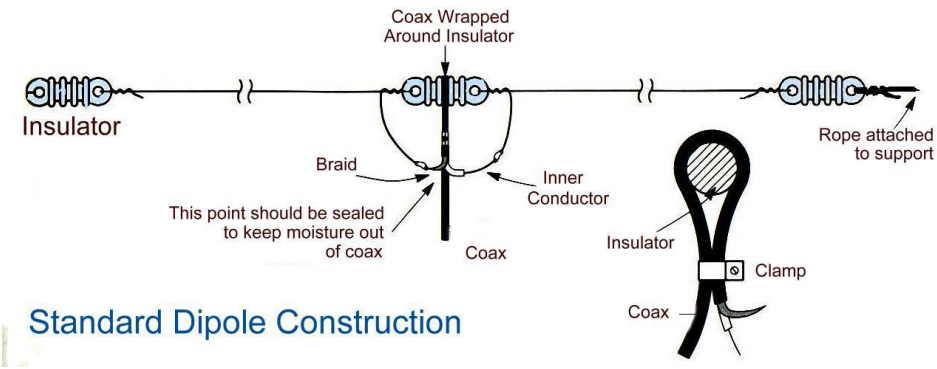
Physical examples or supplied (standard) assessors' diagram of five antenna types. At least four of the five antennas identified correctly.

Ground Plane (Vertical) Antenna



Dipole Antenna

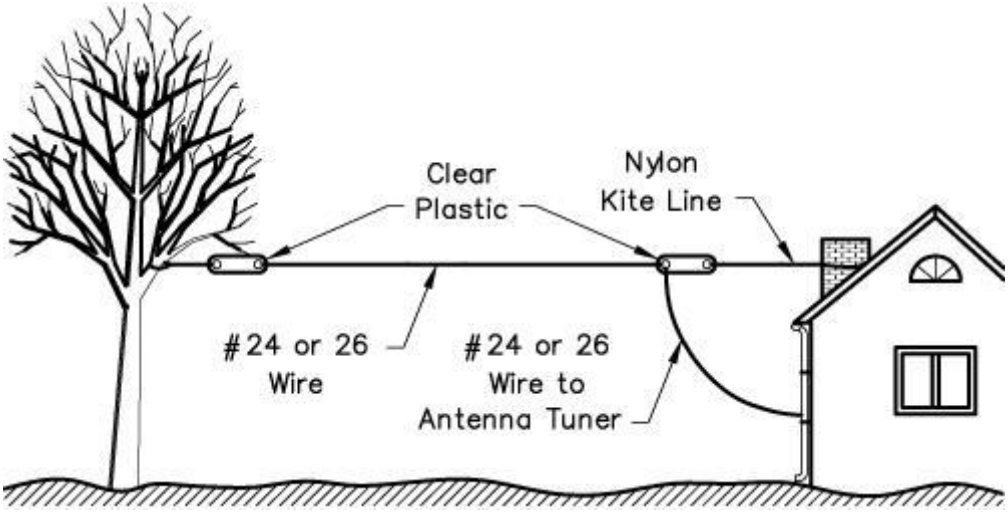




Folded Dipole Antenna

Yagi Antenna

End Fed Antenna



6. Construct an RF choke

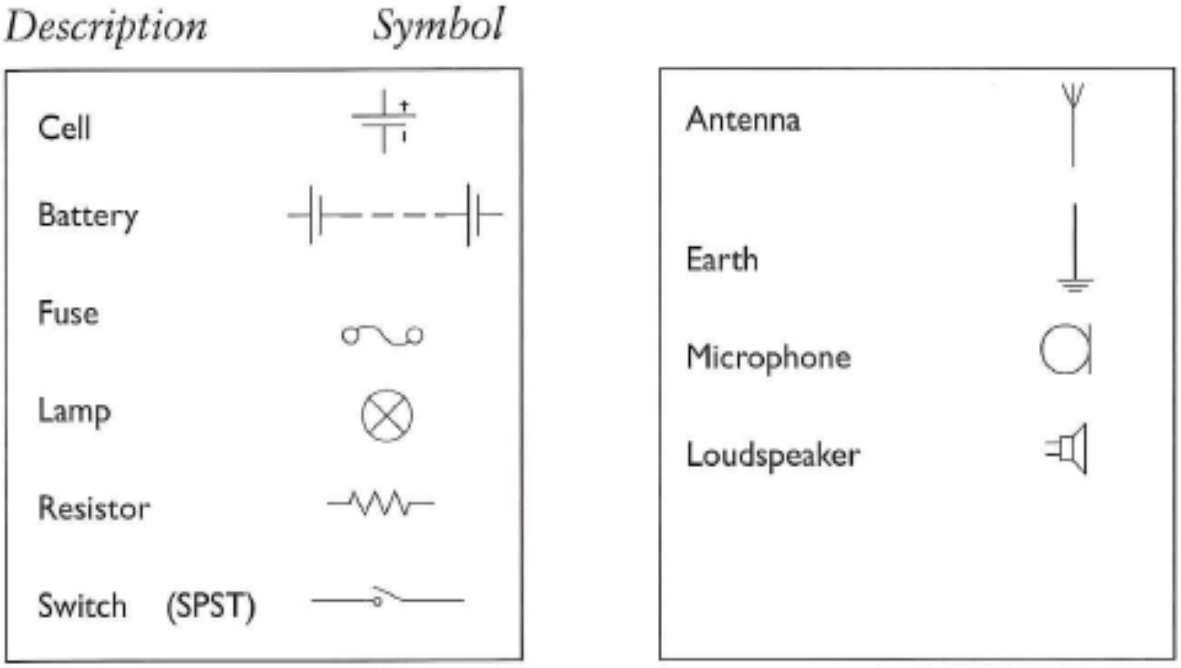
Oral question - Physically demonstrate or fully describe how an RF choke is constructed (of a type used for RF interference suppression). Simulated construction using a provided Ferrite toroid, rod and cable or wire. Candidate physically simulated construction of a simple RF choke for interference suppression.

The name comes from blocking—"choking"—high frequencies while passing low frequencies.



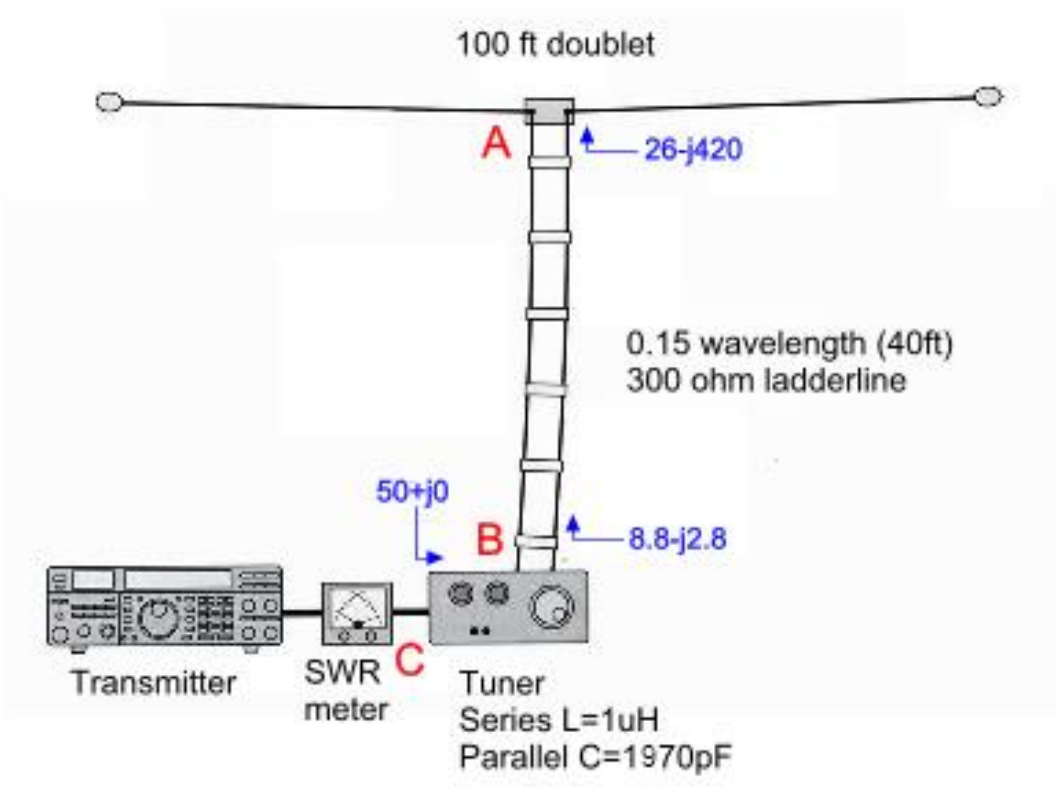
7. Symbol identification

Hand the candidate the standard assessor's symbol chart and ask them to identify at least 5 unlabelled symbols two of which must be antenna and earth. Five symbols correctly identified two of which must be antenna and earth.



8. Demonstrate safely the connection of a transmitter/receiver (transceiver), ready for powering up

Physically connect a transceiver to a power source, an antenna (or dummy load). Connect an external SWR meter and antenna tuner. All interconnecting cables and equipment supplied and in an appropriate uncluttered environment. No other equipment other than that to be connected should be available. Station connected in a safe manner with devices in the correct order.



9. *Identify amateur radio bands for the Foundation Licence (or Standard or Advanced if the candidate is attempting that assessment)*

Candidate is supplied a copy of the appropriate Licence Condition Determination. Candidate to correctly identify (using the LCD) the band limits of any four bands chosen by the assessor. Four bands and their frequency limits correctly identified.

Refer to Schedule 3A of the LCD.

Band	Freq MHz	Mode
80m	3.5 – 3.7	AM, SSB or Hand CW
40m	7 – 7.3	AM, SSB or Hand CW
15m	21 – 21.45	AM, SSB or Hand CW
10m	28 – 29.7	AM, SSB, Hand CW or FM
2m	144 – 148	AM, SSB, Hand CW or FM
70cm	430 - 450	AM, SSB, Hand CW or FM

10. *Demonstrate the protocol(s) required prior to commencing transmitting*

Candidate is provided a tuned, ready to use Amateur Radio station on HF and VHF or UHF. No tuning or adjustments necessary. Candidate to demonstrate the requirement to listen on frequency prior to transmission and may include increasing the receiver gain or opening mute for weak signal detection. This task should be repeated up to three times and may be incorporated in other elements of competency. Demonstrated the requirement to listen on frequency prior to transmission and adjustment of receiver sensitivity as appropriate.

- Check squelch level
- Check AF gain
- Listen

Listen for a short while on the intended frequency to ensure the frequency is not in use. If in doubt, make a short transmission: “This is VK**** is this frequency in use?”
Wait a while to ensure there are no replies.

11. *Demonstrate making on-air calling procedures for HF and VHF or UHF*

Candidate is provided with a ready to use Amateur Radio station. Candidate is to demonstrate preferably on-air the procedure for making a call on HF and VHF or UHF. The call should be to a specific station. This activity may be simulated using a dummy load between candidates or between a candidate and assessor or another radio amateur. This task should be completed on HF and VHF or UHF at least three times. This task can include other elements of competency e.g. Demonstrate protocols prior to transmitting Demonstrated the correct procedure for calling a specific station. Candidate completes three on-air contacts (may be with the same participating station) or simulated on air contacts using the correct protocols.

Page 67 of the handbook

Use the called station callsign no more than 3 times followed by your call sign:
“VK2XYZ VK2XYZ VK2XYZ this is VK1ABC VK1ABC VK1ABC over”

Identify your station at least every 10 minutes.
Close your over with: “VK2XYZ this is VK1ABC over”

A general call would be: “CQ CQ CQ this is VK1ABC VK1ABC VK1ABC over”

A call for distant stations could be: “CQDX CQDX CQDX this is VK1ABC VK1ABC VK1ABC over”

DX can be substituted for a specific area.

FYI: The letters CQ, when pronounced in French, resemble the first two syllables of *sécurité*, and were therefore used as shorthand for the word.
The term DX the telegraphic shorthand for "distance" or "distant".

12. Demonstrate how the signal strength meter is used in conjunction with a signal report.

Using an amateur radio station on HF and VHF or UHF the candidate demonstrates the use of a Signal Strength meter. This is preferably done on-air but could be done by reception of a station and the report provided to the assessor. A detailed description of the RS or RST code is not required. Report can be accompanied by English description e.g. RS + and your audio sounds very good. This task should be repeated up to three times and may be incorporated in other elements of competency. Candidate demonstrates a basic knowledge of the RS or RST and plain language method of providing signal reports.

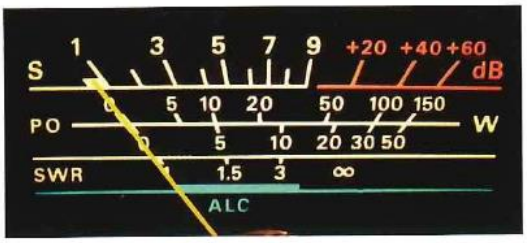
An RST report is a report from a receiving station on the quality and strength of the transmitted signal broken into three sections of Readability, Strength of signal and Tone if CW.

R – Readability graded 1 to 5 where 1 is poor and 5 is perfectly clear.

1. Unreadable
2. Barely readable, occasional words distinguishable
3. Readable with considerable difficulty
4. Readable with practically no difficulty
5. Perfectly readable

S - Strength graded 1 to 9 where 1 is faint and 9 is strong.

1. Faint—signals barely perceptible
2. Very weak signals
3. Weak signals
4. Fair signals
5. Fairly good signals
6. Good signals
7. Moderately strong signals
8. Strong signals
9. Extremely strong signals



S Meter on a typical HF radio

Very strong signals may go above 9 and are read as 5-9 plus 20dB

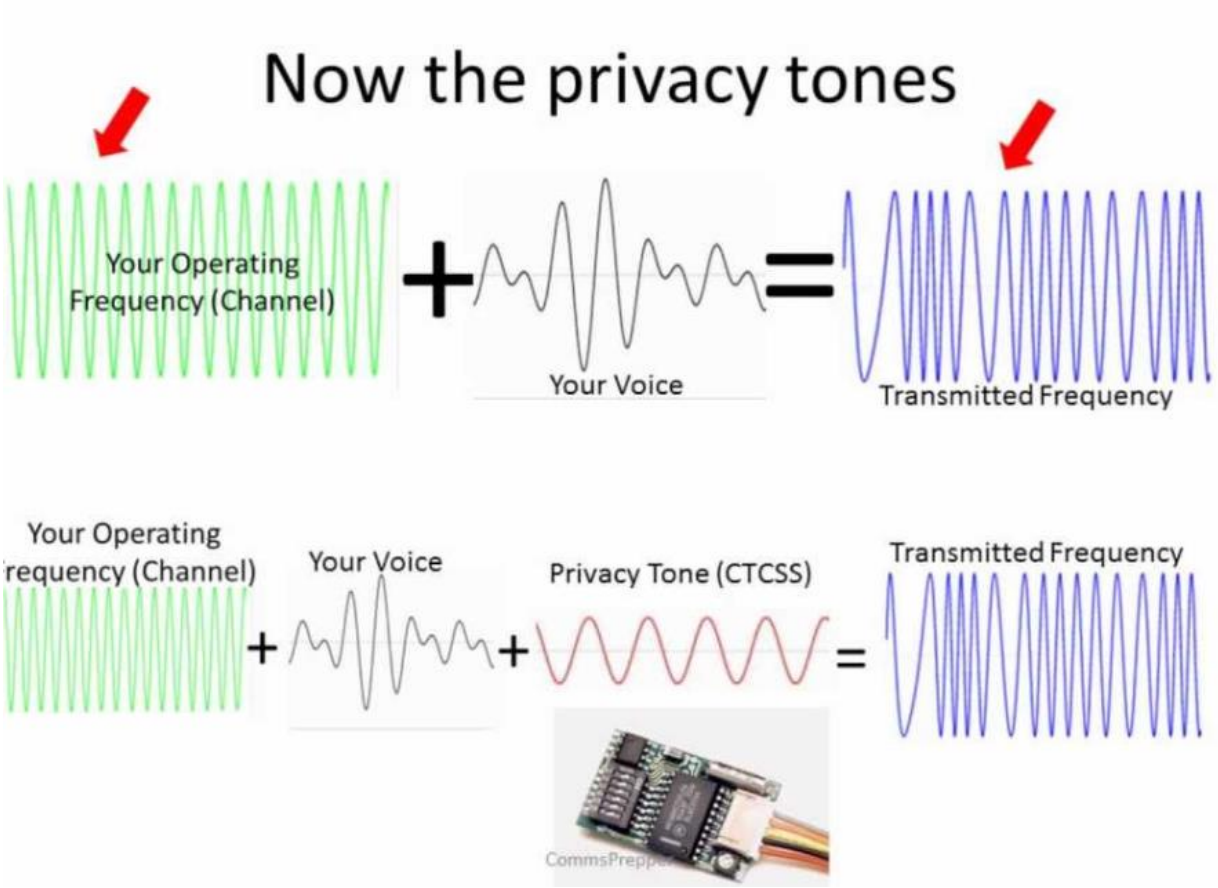
T - Tone graded 1 to 9 where 1 is poor and 9 is clear.

1 Very rough and broad
2 Very rough a.c., very harsh and broad
3 Rough a.c. tone, rectified but not filtered
4 Rough note, some trace of filtering
5 Filtered rectified a.c. but strongly ripple-modulated
6 Filtered tone, definite trace of ripple modulation
7 Near pure tone, trace of ripple modulation
8 Near perfect tone, slight trace of modulation
9 Perfect tone, no trace of ripple or modulation of any kind

13. With the material provided demonstrate the correct use of voice repeaters with and without A) CTCSS B) DTMF

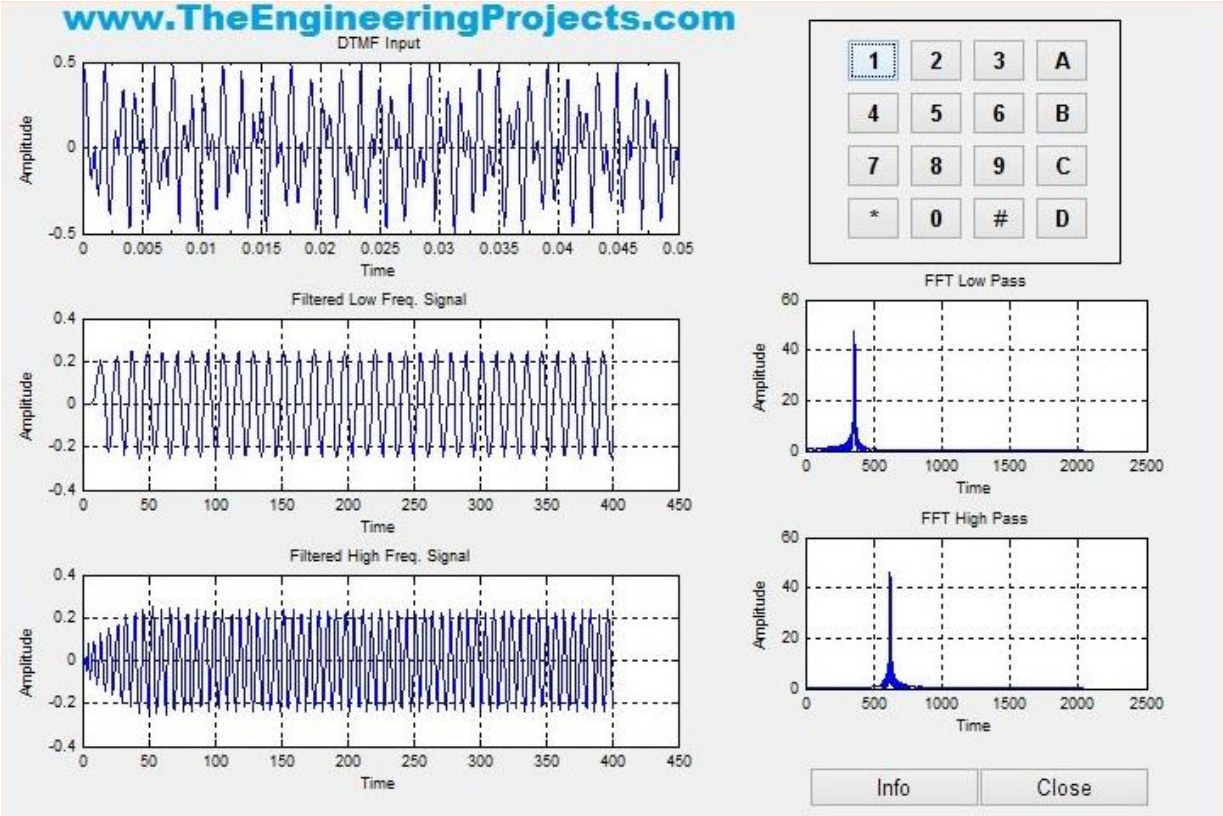
By the use of an Amateur Radio station preferably on-air, the candidate demonstrates the use of voice repeaters with and without CTCSS or DTMF tones. For example, repeater access with and without IRLP. The candidate must demonstrate the need to identify the station before transmitting DTMF tones and may incorporate other elements of competency such as Protocols prior to transmission etc. This task should be repeated at least three times. Candidate demonstrates a rudimentary knowledge of the use of CTCSS and DTMF tones, voice repeater access and placing a call on air.

CTCSS – Continuous Tone Coded Squelch System
A receiver with just a carrier or noise squelch unmutes for any sufficiently strong signal; in CTCSS mode it unmutes only when the signal also carries the correct sub-audible audio tone. Check repeater frequencies for CTSS frequency.



DTMF – Dual Tone Multi Frequency Identify tour station before sending DTMF tones.

DTMF keypad frequencies				
	1209 Hz	**1336 Hz**	**1477 Hz**	**1633 Hz**
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D



IRLP - Internet Radio Linking Project

The **Internet Radio Linking Project**, also called **IRLP**, links amateur radio stations around the world by using Voice over IP (VoIP). Each gateway consists of a dedicated computer running custom software that is connected to both a radio and the Internet. Amateur radio (or *ham*) operators within radio range of a local node can use DTMF tone generators to initiate a node-to-node connection with any other available node in the world. Each node has a unique 4-digit node number in the range of 1000-8999. A real-time searchable list of all nodes worldwide (including their status) is available anytime by viewing the IRLP Network at a Glance. As of June 2009, there are over 3,180 nodes across 7 continents.

To make a call on IRLP, use the following sequence.

- Listen on the radio frequency you use to call the node.
- If not occupied, enter the DTMF numbers.
- Listen to the distant node.
- If occupied, don't break in.
- If clear make a call, "This is VK**** calling CQ from Canberra, Australia."
- Wait for a response.
- Have the QSO

14. Purpose of breaks in transmissions

By oral questioning discuss the purpose of and importance of breaks in transmissions on HF and VHF or UHF. May be done as part of other elements of competency involving on-air operation. Candidate demonstrates the usage of breaks in transmission Candidate demonstrates (preferably on-air) the need for breaks in radio transmissions.

- Don't overload repeaters. They are fitted with time out to prevent continuous use.
- Courtesy - Lets others access the frequency if needed. You may be working a remote station that others may want to access e.g. satellite.
- Listen for others. Some weaker signals of importance may be blocked by your occupation on frequency.
- Safety. In marine radio, the frequencies are quite during the period 3 minutes after the hour and three minutes after the half hour to allow any messages to be read.

15. Change to another frequency (QSY)

By use of an Amateur Radio station after making a contact with another station, demonstrate the correct protocol for changing to another frequency. May be completed as part of another element of competency requiring on-air operation. Candidate on-air, successfully establishes a contact and changes to another frequency and re-establishes contact on that frequency with the contact station.

- Establish contact with another station on a frequency.
- Tell the other station you will check the alternate frequency.
- Move to and check the alternate frequency to see if it is occupied. See number 10 previously.
- If free, return to the original frequency and give the other station the frequency to move to.
- Change to the new frequency and call the other station.
- Continue the QSO.

16. Q-Code and the Phonetic Alphabet. Use of plain language

By oral questioning only the candidate should be asked the purpose of the Q-code and the phonetic alphabet. Including the importance of standardised codes and signals over radio. Use of language slang etc. Note- while not preventing such use- it is not a requirement for the candidate to use the Q-code or the phonetic alphabet in any part of this assessment. Candidate provides a knowledge of the existence (only), of the Q-code and Phonetic Alphabet and knowledge of purpose for their use. Candidate demonstrates by answers the importance of the use of plain language in radio communications.

Although Q codes were created when radio used Morse code exclusively, they continued to be employed after the introduction of voice transmissions. To avoid confusion, transmitter call signs are restricted; no country is ever issued an ITU prefix starting with "Q". Codes in the range

QAA–QNZ are reserved for aeronautical use; QOA–QQZ for maritime use and QRA–QUZ for all services.

QRK - What is the readability of my signals?	The readability of your signals is …
QRL – Are you busy?	I am busy.
QRM - Are you being interfered with?	I am being interfered with **(M= manmade)**
QRN - Are you troubled by static?	I am troubled by static **(N=noise)**
QRO - Shall I increase transmitter power?	Increase transmitter power **(O=output)**
QRP - Shall I decrease transmitter power?	Decrease transmitter power **(P=power)**
QRS - Shall I send more slowly?	Send more slowly **(S=slow)**
QRT - Shall I stop sending?	Stop sending **(QRT=quiet)**
QRZ - Who is calling me?	You are being called by …
QRV - Are you ready?	I am ready
QRX – I will be right back.	Pse QRX one.
QSB - Are my signals fading?	Your signals are fading
QSL - Can you acknowledge receipt?	I am acknowledging receipt **(L=letter)**
QSO - Can you communicate with … direct?	I can communicate with … direct
QSY Shall I change frequency?	Change to another frequency
QTH - What is your location?	My location is …. **(H=home)**

The phonetic language - also known as the 'spelling alphabet' or the NATO phonetic alphabet - is used by professional communicators, especially police, military and other emergency and armed forces, to identify letters precisely, either when communicating initials, abbreviations or spellings of words.

A - Alpha	**N** - November	**.** - Decimal
B - Bravo	**O** - Oscar	**.** - Stop
C – Charlie	**P** - Papa	
D - Delta	**Q** - Quebec	**0** - Zero
E - Echo	**R** - Romeo	**1** - Wun
F - Foxtrot	**S** - Sierra	**2** - Two
G - Golf	**T** - Tango	**3** - Tree
H - Hotel	**U** - Uniform	**4** - Fower
I - India	**V** - Victor	**5** - Fife
J - Juliet	**W** - Whiskey	**6** - Six
K - Kilo	**X** - X-ray	**7** - Seven
L - Lima	**Y** - Yankee	**8** - Ait
M - Mike	**Z** - Zulu	**9** - Niner

17. Transmitter power measurement and adjustment.

Demonstrate the measurement of output power of a transmitter. Adjust the transmitter power to within legal limits. This may be done using an Amateur Radio station connected to a dummy load. No modulating sources other than voice are required. No modulation depth monitoring is required Estimation of power only is required. No complex PEP measurements. Estimate made using a commercial power measuring device. The power meter should preferably be an external instrument. This measurement should be done on SSB and FM. Candidate demonstrates the ability to make simple power measurements and adjustment using a commercial wattmeter.

- See number 8 for setup.
- Transmit and read the power from the meter

18. ***Measurement of SWR***

Preferably with the use of an Amateur Radio station connected to an antenna, the candidate should demonstrate the ability to make a simple SWR measurement. This task may be completed off air with simulated mismatched loads. Candidate should be able to disclose to the assessor if the reading obtained is satisfactory (equal to or less than 1.5:1) The task should be repeated 2-3 times. Candidate demonstrates the correct technique (including identification of transmission if conducted on-air) for making a simple SWR measurement. Candidate is able to interpret if the reading is within acceptable limits (equal to or less than 1.5:1)

Standing Wave Ratio (SWR) is a measure of impedance matching of loads to the characteristic impedance of a transmission line or waveguide. Impedance mismatches result in standing waves along the transmission line, and SWR is defined as the ratio of the partial standing wave's amplitude at an antinode (maximum) to the amplitude at a node (minimum) along the line.

- Setup as in number 8.
- Measure Forward and Reverse power.
- Measure Standing Wave Ratio (SWR)

19. Correcting high SWR

Using oral questioning the candidate is asked on methods available to correct an antenna system that may have a high SWR. Examples use an antenna tuner or correct an antenna fault or adjust the antenna. Specific adjustments or tuning are not required in this assessment task. Candidate orally describes what remedial action may be taken to rectify a high SWR problem.

Some causes for high SWR can be:

- Broken wires
- Faulty antenna
- Damaged antenna

If the antenna is new and used for the first time, the high SWR may indicate the antenna needs tuning correctly.

The higher the frequency the shorter the antenna.

If the SWR is good below the required frequency; the antenna is too long.
If the SWR is good above the required frequency; the antenna is too short.

Can be corrected by inserting an antenna tuner. But this only matches the feedline impedance to the transmitter and does not alter the antenna.

20. High voltage and currents

Oral questions and responses from the candidate to ascertain that the candidate is aware of the dangers of high voltage (electric shock) and current (heat, burning and possibly fire)
Candidate demonstrates an awareness of the dangers of high voltages and currents.

Current kills.

- Ensure power is always disconnected before accessing any internal circuitry.
- Use a Residual Current Device (RCD or Safety Switch) if working with live voltages.
  The RCD protects people from electrical accidents while a circuit breaker or fuse protects wiring and electrical systems in your home.
- Lightening has very high current levels.
- Antennas also carry high voltages and current.