Operating practices and procedures

Good operating practices and procedures

7A1

Understand why one should listen on a frequency before calling and then ask if the frequency is in use.

Before using a frequency for the first time it is important to check that the frequency is not in use. It is considered poor form to blast in on top of an existing QSO, and this includes "tuning up". So before using a frequency for the first time you listen for a short period to ensure that no-one else is operating. Remember that it is possible that you may only be able to hear one side of a QSO so just because you don't hear anything immediately doesn't mean that the frequency isn't in use.

Having listened for a short period before initiating a call, just to be sure you should always ask "**Is this frequency in use?**" remembering to identify yourself using your callsign and await a response. If there is a QSO taking place that you can't hear, one or other of the participants will normally respond politely to this request and you can move to an alternative frequency.

If you get no response to your question then you can presume the frequency is clear and carry on with your call.

7A2

Recall how to make a CQ call in SSB and FM modes

Calling CQ is one of the times that we are allowed to broadcast, that is to send a transmission where our intent is for it to be received by a number of people. The way to call CQ varies depending on whether or not there is a "**calling frequency**" or "**calling channel**".

When there is a calling frequency or calling channel, which is the norm on all of the VHF/UHF bands in the FM simplex allocations, then because people know where to listen the format of the CQ call can be kept reasonably short, typically:

"CQ CQ CQ this is M7XYZ calling CQ."

If the first call elicits no response then try again after about a minute or less; someone listening might not have caught your callsign and may be reluctant to respond without this information. Alternatively, stations might be "scanning" across frequencies and have missed your first call.

However, after a few calls go unanswered the probability is that there is no one monitoring at that time and you should try a different band or try at a later time.

On the HF bands, there isn't a specific calling channel or frequency, except for some of the specialist modes or for particular contacts. Due to the fact that there is no common point to monitor, people often tune around looking for calls and when a call is heard it can take a little time to tune the station in accurately. For this reason, it is helpful to give a longer CQ call on the HF bands, typically:

"CQ CQ CQ, CQ CQ CQ. This is M7XYZ, Mike Seven X-Ray Yankee Zulu calling CQ CQ CQ, M7XYZ calling CQ."

For the reasons stated this call may not be picked up on the first repetition, so if there is no immediate response the call can be repeated very shortly after the previous one was completed. It may take many such calls on HF for your station to be "discovered".

7A3

Understand the need to move off the calling channel when on VHF/UHF once contact is established.

Understand the meaning of Centre of Activity.

On VHF/UHF where "**calling channels**" such as 145.500MHz on 2m FM (V40) or 433.500MHz on 70cm FM (U280) are used to initiate a contact it is accepted practice to

agree on a secondary frequency early in the QSO (contact or conversation) and to QSY (change frequency) to the agreed secondary frequency to complete the contact, leaving the calling channel available for the next person to call on. Generally, the choice of where to change to is made by the person calling CQ but not always.

If the agreed secondary frequency is in use, and remember that whilst you might not hear anything your QSO partner might, then return to the calling channel and agree to an alternative secondary frequency and repeat the change process until a free secondary frequency is located. Remember that you must give your callsign on the new frequency to comply with the licence conditions.

Extracts from Band Plans		
Band	**Frequency Range**	**Description**
10m **(28MHz)** 28.000MHz - 29.700MHz	29.100 - 29.200MHz	FM Simplex 10kHz Channel Spacing
	29.200 - 29.300MHz	Automatic data stations
	29.300 - 29.510MHz	Satellite Links
	29.510 - 29.520MHz	Guard Band
	29.520 - 29.590MHz	FM Repeater Inputs RH1 - RH8 10kHz Channel Spacing
	29.600MHz	**FM Calling Channel**
	29.610MHz	FM Simplex Repeater (parrot)
	29.620 - 29.700	FM Repeater Outputs RH1 - RH8 10kHz Channel Spacing
6m **(50MHz)** 50.000MHz - 52.000MHz	50.710 - 50.890MHz	FM/DV Repeater Outputs 10kHz Channel Spacing
	51.210 - 51.390MHz	FM/DV Repeater Inputs 10kHz Channel Spacing
	51.410 - 51.590MHz	FM/DV Simplex 20kHz Channel Spacing **51.510MHz FM Calling Channel**
	51.810 - 51.990MHz	FM/DV Repeater Outputs (IARU Aligned Channels)
4m **(70MHz)** 70.000MHz - 70.500MHz	70.294 - 70.500MHz	All Modes Channelised Operations with 12.5kHz Channel Spacing **70.450MHz FM Calling Channel**

Extracts from Band Plans		
Band	**Frequency Range**	**Description**
2m (144MHz) 144.000MHz - 146.000MHz	144.990 - 145.1935MHz	RV48 - RV63 FM Repeater Inputs 12.5kHz Channel Spacing
	145.200 - 145.5935MHz	V16 - V47 FM Simplex 12.5kHz Channel Spacing **145.500MHz (V40) FM Calling Channel**
	145.5935 - 145.7935MHz	RV48 - RV63 FM Repeater Outputs 12.5kHz Channel Spacing
70cm (430MHz) 430.000MHz - 440.000MHz	433.400 - 433.575MHz	FM Simplex channels U272 - U286 25kHz Channel Spacing **433.500MHz (U280) FM Calling Channel**

The purpose of moving off the **calling channel** should be obvious, but as the frequency is defined as a calling frequency it is considered impolite to hold a long QSO (contact or conversation) on the calling frequency denying others access to the calling frequency. A couple of overs to agree where to move to is fine but a 30-minute "rag chew" isn't.

Some frequencies are listed in the band plans as "**centres of activity**", an example of this is 144.300MHz which is shown as the 2m SSB Centre of Activity. Unlike a "calling channel" a centre of activity is a guide to where users of a particular mode or activity tend to operate. The band plan does not give such users precedence over other modes or activities.

7A4

Recall the meaning of the optional suffixes /A, /P, /M and /MM

A "suffix" is a term or abbreviation that is appended to the callsign to give further information about the station.

Under the February 2024 Licence Conditions in respect of "suffixes" it states:

"***Condition 6 - Radio Equipment Use***

…

IDENTIFICATION

…

26. Any suffix, following the 'slash' symbol ("/") may be added to the transmitted callsign."

This means that it is permissible to add any kind of suffix such as:

- /QRP to signify a low power station
- /SOTA to signify a Summits on the Air activation
- /<Special Event> to signify a Special Event such as Railways on the Air or Mills on the Air

There used to be a specific and defined mandatory set of suffixes that remain in common use despite their use being optional with the following meanings:

- /A - Operating from a **Temporary Location** (a location other than the Main Station Address given in the licence document) that can be identified by a **postal address** such as: a holiday home, a hotel, a friend's house or an office. The phrase "alternate" or "alternative" is sometimes used in place of "/A". The usage is typically "M7XYZ stroke A" or "M7XYZ Alternate" or "M7XYZ Alternative".
- /P - Operating from a **Temporary Location** (a location other than the Main Station Address given in the Licence Document) that cannot be identified directly by a postal address such as: a field day site or a SOTA summit. The phrase "portable" is sometimes used in place of "/P". The usage is typically "M7XYZ stroke P" or "M7XYZ Portable".
- /M - Operating mobile. This could be in a vehicle but also covers situations where the radio is on your person such as using a handheld. The phrase "mobile" is often used in place of "/M". The usage is typically "M7XYZ stroke M" or "M7XYZ Mobile".

- /MM - "Maritime Mobile", operating from a Vessel at Sea. Maritime Mobile used to mean operating from a vessel on the seaward side of Low Water as defined on the Admiralty Charts, or equivalent in foreign administrations, (there were some exceptions relating to tidal estuaries for simplicity) and maritime mobile was only the province of Full Licensees. Following the revisions to the Licence in February 2024 it has been clarified that the Licensee is authorised to:
    - Establish, install and use the Radio Equipment in and over the United Kingdom, the Channel Islands and the Isle of Man in each case including their territorial sea; and
    - Use the Radio Equipment aboard any ship or aircraft registered in the United Kingdom, the Channel Islands or the Isle of Man in international waters or airspace. This is subject to the agreement of the vessel's master.

7A5

Recall the phonetic alphabet.

Phonetics are employed when there are difficult conditions or where accurate communication of details is required. There is no requirement to use phonetics but they are useful. Obviously, it is important that the phonetics employed are standardised so that they have the same meaning wherever they are used.

At the moment the standard NATO phonetic alphabet is recommended and examined, however, you will come across several variants on-air, particularly from older operators who learnt pre-NATO standards such as "Able", "Baker" etc.

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

7A6

Understand the advisability and common practice of keeping a log.

Understand why UTC is used for logging time.

Recall that a log should detail the following information: date, time, mode, call sign of station worked for QSL and contest purposes.

There is normally no requirement or obligation to maintain a log. The exception to this is when Ofcom directs a log to be kept for the purposes of investigating interference. However, it is particularly valuable to keep a log and it is essential to have a log to enter any contests or claim any awards. It is also useful to keep a log of contacts that are likely to be confirmed by a hard copy or virtual QSL card. A QSL card is a confirmation record

that the QSO took place and whilst they are not usually exchanged for local VHF FM contacts or relatively mundane or regular HF contacts they are exchanged for "special" contacts such as first contacts into a new country, contacts with Special Event or DXpedition stations or contacts with "personalities".

Hard copy QSL cards can be sent directly through the postal system but are more usually sent through QSL Bureaus operated by the various National Organisations such as the RSGB, ARRL etc. Nowadays, however, there are electronic systems such as eQSL.cc or QRZ.com which can accept a manual or automated upload of a computerised log in the correct format and automatically generate cards to any registered members who are in the uploaded log.

If you are keeping a log then all dates/times should be recorded in **UTC** (Universal Coordinated Time) which is equivalent to GMT (Greenwich Mean Time). This means that during BST (British Summer Time) when the clocks are advanced 1 hour it is necessary to subtract 1 hour from the observed time BST to get the time UTC.

Computer logging programs are usually able to do this automatically as long as the computer is correctly configured, and many operators have a shack clock that is set to UTC and never adjusted even during Summer Time.

The reason why contacts are logged using UTC is that it ensures all operators, wherever they are in the world, log in the same timezone avoiding difficulties associated with international time zones and making it easier to compare logs from international sources.

Whether the log is kept on computer or on paper there are certain items that should be recorded for the log to be useful, these are:

- Date of contact (UTC)
- Time of contact (UTC), ideally the time the QSO started and ended if the QSO is drawn out
- Mode of operation (FM, AM, SSB, CW, PSK31, FT8 etc.)
- Callsign of station worked

Optionally some people like to record:

- Frequency or band of operation
- Details of signal reports exchanged
- Transmitted power
- Personal details of the other station such as:
    - Name
    - Location
    - Equipment being used by the other station
- Antenna in use
- Beam Heading
- Special details such as IARU Locator, WAB (Worked All Britain Square), SOTA reference etc.

Computer logs offer the ability to quickly search for previous contacts with the same station and recall information such as beam headings.

DATE TIME	STATION CALLED	CALLED BY	HIS SIGNAL RST	MY SIGNAL RST	FREQ	EMISSION TYPE	POWER INPUT WATTS	TIME OF ENDING QSO	OTHER DATA NAME	QSLs S	QSLs R
9/10/78											
14:58	NDØFTR	x	589	579	7.13	A-1	100	14:83	HUGH	X	X
9/19/78											
19:53	WB7WCW	x	599	579	21.14	A-1	60	20:25	BOB	X	
9/24/78											
13:16	KA9CVP	x	579	589	7.13	A-1	100	14:08	BILL	X	X
14:09	WØIYT	x	599	59?+	7.13	A-1	100	14:38	JOE	X	X
9/24/78											
21:25	KA8RHL	x	579	589	7.11	A-1	100	21:53	ED	X	X
9/30/78											
07:55	WØIDI	x	589	599	7.1	A-1	100	08:10	ALLEN	X	
10:55	KAØBDE	x	579	599	7.13	A-1	100	10:08	DOUG	X	X
10:08	NØAFY	x	599	599	7.13	A-1	100	10:30	BOB	X	X
13:10	WBØ?CT	x	579	599	7.13	A-1	100	13:25	FRED	X	X
10/1/78											
14:55	WD9IVI	x	589	599	7.12	A-1	100	15:15	GREG	X	X
10/2/78											
16:15	KA9BKJ	x	579	599	7.14	A-1	100	17:53	TERRY	X	X
18:15	WD4IAG	x	579	589	7.14	A-1	100	18:27	PAUL	X	X
10/3/78											
17:00	KAØADR	x	579	579	7.13	A-1	100	17:15	KELLY	X	X
10/4/78											
17:40	KAØBRL	x	589	599	7.13	A-1	100	17:55	MORGAN	X	
21:00	WD5CRE	x	579	589	21.15	A-1	60	21:20	CHARLES	X	X
10/5/78											
17:45	WB2PJT	x	489	387	21.14	A-1	60	18:02	BRENT		
10/7/78											
10:35	K8KGL	x	589	599	7.12	A-1	100	10:48	GRANT		

Contest logs are usually more minimal recording only the information pertinent to the contest exchange.

7A7

Understand that the transmission of music and the use of offensive or threatening language whilst on the air is unacceptable in amateur radio.

Understand how to respond to music or inappropriate language overheard or received from other stations.

Conversations on Amateur Radio should be polite and respectful of differences in culture. Remember that radio signals do not respect national or international borders and that your

signals or the signals of those you are in contact with can be received by people from different cultures or with different beliefs.

Abusive, threatening or profane language has no place in Amateur Radio and subjects or topics that might encourage this, such as politics and religion, should be avoided. Equally, we are not DJs or music moguls and should avoid acting like one by playing music.

Sadly there is a minority of people, some licensed but most not, whose sole purpose in life seems to be to try to disrupt or spoil the enjoyment of Amateur Radio. They do this typically by causing interference, swearing, playing music or other dubious sound effects, occupying frequencies and keying over other operators.

Should you have the misfortune to come across people like this or to be interrupted by this type of person the golden rule has to be: "Don't rise to the bait". Do not feed the trolls, any sort of response: on-air, off-air, via social media or even discussed at the pub, any sort of acknowledgement simply gives these abusers the audience they crave.

Under no circumstances should you attempt to challenge these people on air or in person, nor should you threaten them. Remember you are not allowed to contact unlicensed people and doing so could just as easily land you in trouble.

If you come across this sort of behaviour move on to a different frequency or band. If the interference is on a repeater or calling channel try again later. If the perpetrators are ignored and don't know what effect they're having they'll usually get bored and move on to something else and we can get back to enjoying radio contacts.

7A8

Recall the advisability to carry out tests to ensure that the station is not causing undue interference to other radio users.

The licence requires that "*The Licensee shall ensure that the Radio Equipment is designed, constructed, maintained and used so that it does not cause any Undue Interference to any wireless telegraphy*".

It is therefore incumbent upon the Licensee to conduct tests from time to time to determine or demonstrate that their station is compliant.

Whilst there are some specific tests the simplest way to handle this is from time to time to:

- Ask another amateur to listen a few kHz away from your transmitted signal to see how wide your signal is
- Listen on multiples of your transmitted frequency, i.e, if you are transmitting on 7.1MHz, listen on 14.2MHz, 21.3MHz and 28.4MHz to see if your signal can be heard. If not then all is good
- If you have access to a second receiver, transmit into a dummy load and listen for your own signal

Band Plans

7B1

Recall why band-plans are used.

Identify items on a typical band-plan (e.g. calling frequencies and recommended modes).

Recall that narrow band modes are at the lower end of most bands.

Recall that lower sideband operation normally occurs below 10MHz and upper sideband above 10MHz.

Recall that transmissions on frequencies shown in the band plans for beacons should be avoided.

Note: For the purposes of the examination narrow modes are CW and data.

A copy of the relevant Band Plans will be available during the examination but may not be ones in current use.

Reference Booklets containing the examination plans are available on the RSGB web site.

The Schedule to the Licence, which was covered in Topic 1 Licence Conditions, sets out the minimum and maximum frequencies associated with each band and is a legal and enforceable document. However, the Schedule to the Licence gives no information on how to operate within the band in terms of what mode is recommended at different frequencies within the band, how much bandwidth a signal should occupy, where calling channels or centres of activity are positioned or where key things like beacons are positioned.

Radio waves can travel beyond national boundaries and therefore the band plans are established to protect things like beacons that are part of international propagation research projects from interference.

Up to date copies of the band plans are available online at the RSGB website and are usually published in the annual callbook:

https://rsgb.org/main/operating/band-plans/

In the exam copies of 20m and 2m band plans are provided to assist with answering questions relating to the band plan.

14MHz (20m)	Necessary Bandwidth	UK Usage
14,000-14.060kHz	200Hz	**Telegraphy - Contest Preferred** 14,055kHz - QRS (slow telegraphy) Centre of Activity
14,060-14,070	200Hz	**Telegraphy** 14,060kHz - QRP (low power) Centre of Activity
14,070-14,089	500Hz	**Narrowband Modes**
14,089-14,099	500Hz	**Narrowband Modes - Automatically Controlled Data Stations (unattended)**
14,099-14,101		**IBP - Reserved Exclusively for Beacons**
14,101-14,112	2.7kHz	**All modes - Automatically Controlled Data Stations (unattended)**
14,112-14,125	2.7kHz	**All modes (excluding digimodes)**
14,125-14,300	2.7kHz	**All Modes - SSB Contest Preferred Segment** 14,130kHz - Digital Voice Centre of Activity 14,195 ±5kHz - Priority for DXpeditions 14,230kHz - Image Centre of Activity 14,285kHz - QRP (low power) Centre of Activity
14,300 - 14,350	2.7kHz	**All Modes** 14,300kHz - Global Emergency Centre of Activity
Licence Notes:	Amateur Service - Primary User 14,000-14,250kHz Amateur Satellite Service - Primary User	

There are some things to notice when looking at the 20m band plan:

- Narrowband modes (CW/Morse/Telegraphy and Digital Modes such as PSK31) are at the lower end of the band and wider modes (SSB) are at the upper end of the band. This pattern is common to all of the band plans
- Being an HF band there are no calling channels

- There are a number of "**Centres of Activity**" identified to assist with certain operations such as:
  - 14.055MHz for Slow Morse
  - 14.060MHz for Low Power Morse
  - 14.130MHz for Digital Voice
  - 14.230MHz for Images (typically SSTV)
  - 14.285MHz for Low Power SSB
  - 14.300MHz for Emergency Coordination
- There is a beacon segment specifically identified and transmission on these frequencies by anything other than a beacon should be avoided.

SSB transmissions on 20m (14MHz) would be made in **Upper Sideband**. Generally above 10MHz SSB is Upper Sideband and below 10MHz SSB is Lower Sideband.

The 2m Band plan is similar but larger since there is 2MHz of bandwidth compared to 350kHz on 20m. This can make it appear more complex and harder to locate specific information. It also doesn't fit on one page easily!

144MHz (2m)	**Necessary Bandwidth**	**UK Usage**
144.000-144.025MHz	2700Hz	**All Modes - including Satellite Downlinks**
144.025-144.100	500Hz	**Telegraphy (including EME CW)** 144.050MHz - Telegraphy Centre of Activity 144.100MHz - Random MS Telegraphy Calling (Note 1)
144.110-144.150	500Hz	**Telegraphy and MGM** EME MGM activity (Note 7)
144.150-144.400	2700Hz	**Telegraphy, MGM and SSB** 144.175MHz - Microwave talk-back 144.200MHz - Random MS SSB

144MHz (2m)	Necessary Bandwidth	UK Usage
		144.250MHz - GB2RS News Broadcast and Slow Morse 144.260MHz - See Note 10 144.300MHz - SSB Centre of Activity 144.370MHz - MGM calling Frequency
144.400-144.490		**Propagation Beacons Only**
144.490-144.500		**Beacon Guard Band** 144.491MHz - 144.493 Personal Weak Signal MGM Beacons (BW: 500Hz max)
144.500-144.794	20kHz	**All Modes (Note 8)** 144.500MHz - Image Modes Centre (SSTV, FAX, etc) 144.600MHz - Data Centre of Activity (MGM, RTTY, etc.) 144.6125MHz - UK Digital Voice (DV) calling (Note 9) 144.625-144.675MHz - See Note 10 144.750MHz - ATV Talk-back 144.775-144.794MHz - See Note 10
144.794-144.990	12kHz	**MGM/Digital Communications** 144.800-144.9875MHz - MGM/Digital Communications 144.8000MHz - Unconnected Nets - APRS, UiView etc (Note 14) 144.8125MHz - DV Internet Voice Gateway 144.8250MHz - DV Internet Voice Gateway 144.8375MHz - DV Internet Voice Gateway

144MHz (2m)	Necessary Bandwidth	UK Usage
		144.8500MHz - DV Internet Voice Gateway 144.8625MHz - DV Internet Voice Gateway 144.9250MHz - TCP/IP Usage 144.9375MHz - AX25 Usage 144.9500MHz - AX25 Usage 144.9625MHz - FM Internet Voice Gateway 144.9750MHz, 144.9875MHz To Be Decided (Note 11)
144.990-145.1935	12kHz	**FM/DV RV48-RV63 Repeater Input Exclusive (Note 2 & 5)**
145.200	12kHz	**FM/DV Space communications (e.g. ISS) - Earth-to-Space** 145.2000MHz (Note 4 & 10)
145.200-145.5935	12kHz	**FM/DV V16-V48 - FM/DV Simplex (Note 3, 5 & 6)** 145.2250MHz - See Note 10 145.2375MHz - FM Internet Voice Gateway (IARU common channel) 145.2500MHz - Used for Slow Morse Transmissions 145.2875MHz - FM Internet Voice Gateway (IARU common channel) 145.3375MHz - FM Internet Voice Gateway (IARU common channel) 145.5000MHz - FM Calling (Note 12) 145.5250MHz - Used for GB2RS News Broadcast. 145.5500MHz - Used for Rally/Exhibition Talk-in 145.5750MHz, 145.5875MHz (Note 11)

144MHz (2m)	Necessary Bandwidth	UK Usage
145.5935-145.7935	12kHz	**FM/DV RV48-RV63 Repeater Output (Note 2)**
145.800	12kHz	**FM/DV Space Communications (e.g. ISS) - Space-Earth**
145.806-146.000	12kHz	**All Modes - Satellite Exclusive**
Note 1:	Meteor scatter operation can take place up to 26kHz higher than the reference frequency.	
Note 2:	12.5kHz channels numbered RV48-RV63. RV48 input = 145.000MHz, output = 145.600MHz.	
Note 3:	12.5kHz simplex channels numbered V16-V46. V16=145.200MHz.	
Note 4:	Emergency Communications Groups utilising this frequency should take steps to avoid interference to ISS operations in non-emergency situations.	
Note 5:	Embedded data traffic is allowed with digital voice (DV)	
Note 6:	Simplex use only - no DV gateways	
Note 7:	EME activity using MGM is commonly practised between 144.110-144.160MHz	
Note 8:	Amplitude Modulation (AM) is acceptable within the All Modes segment. AM usage may often be found on 144.550MHz. Users are asked to consider adjacent channel activity when selecting operating frequencies.	
Note 9:	In other countries IARU Region 1 recommends 145.375MHz	
Note 10:	May be used for Emergency Communications and Community Events	
Note 11:	May be used for repeaters in other IARU Region-1 countries	
Note 12:	DV users are asked not to use this channel, and use 144.6125MHz for calling	

144MHz (2m)	Necessary Bandwidth	UK Usage
Note 13:	Not used	
Note 14:	144.800 use should be NBFM to avoid interference to 144.8125 DV Gateways	
Licence Notes:	Amateur Service and Amateur Satellite Service - Primary User. Beacons may be established for DF competitions except within 50 km of TA 012869 (Scarborough)	

You can see that in addition to "centres of activity" there are also "calling channels".

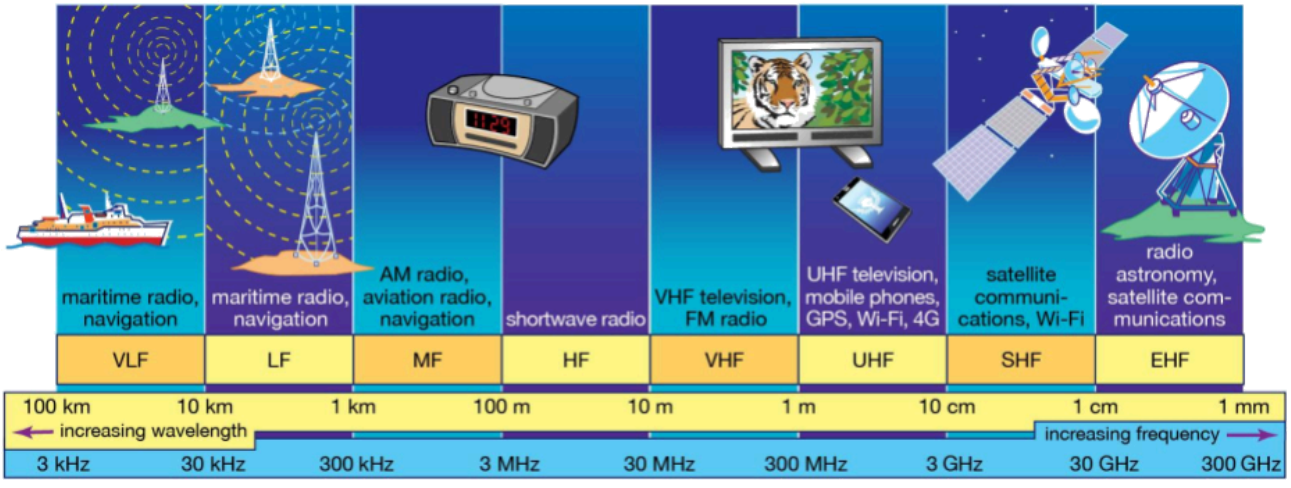
7B2

Recall that frequency bands are allocated for a particular use, e.g. broadcasting, aeronautical, maritime and amateur.

Recall the frequency bands for HF, VHF, and UHF radio signals.

Recall that some amateur bands are shared with or adjacent to other spectrum users.

Identify items on a provided chart of spectrum users.



The figure above shows the RF spectrum, Radio Amateurs have a number of allocations throughout this range, but clearly our transmissions must coexist with other users of the adjoining spectrum. Allocations granted to Amateurs with a Foundation Licence are as follows:

- **HF (3MHz - 30MHz):**
  - 80m (3.5MHz - 3.8MHz), 40m (7.0MHz - 7.2MHz), 30m (10.10MHz - 10.15MHz), 20m (14.00MHz - 14.35MHz), 17m (18.068MHz - 18.168MHz), 15m (21.00MHz - 21.45MHz), 12m (24.89MHz - 24.99Mhz) and 10m (28.0MHz - 29.7Mhz)
- **VHF (30MHz - 300MHz):**
  - 6m (50.0MHz - 52.0MHz), 4m (70.0MHz - 70.5MHz), 2m (144MHz - 146MHz)
- **UHF (300MHz - 3,000MHz (3GHz)):**
  - 70cm (430MHz - 440MHz)

The table below shows the adjoining users in a section of the VHF band:

Frequency	Use
87.5 - 108.0MHz	Broadcasting
108.0 - 117.975MHz	Aeronautical Radionavigation
117.975 - 137.0MHz	Aeronautical Mobile
137.0 - 138.0MHz	Space Operations and Space Research
138.0 - 144.0MHz	Land Mobile
144.0 - 146MHz	**Amateur and Amateur Satellite**
146.0 - 149.9MHz	Mobile (except aeronautical mobile)
149.9 - 150.05MHz	Radionavigation - Satellite
150.05 - 152.0MHz	Radio Astronomy
152.0 - 156.0MHz	Land Mobile
156.0 - 158.525MHz	Maritime Mobile
158.525 - 160.6MHz	Land Mobile
160.6 - 160.975MHz	Maritime Mobile

This table is provided in the exam and you can be asked to identify what type of signal or user would be encountered if tuned to a specific frequency somewhere in the range of the overall table.

Repeaters

7C1

Recall that repeaters are mainly intended to extend the range of mobile stations.

Recall why a frequency offset between transmit and receive is needed.

Recall why a CTCSS tone is needed to access a repeater and why different repeaters may have different tones.

Recall why repeaters may have a 'reset' tone and a time-out facility.

Recall that simplex operation on repeater frequencies should not take place.

Note: Questions may ask why particular facilities (such as frequency offset) exist, what operational issue they address or how they should be used to establish or maintain a contact.

A repeater is a radio installation that is created, installed and maintained so as to improve the distance and coverage of lower power handheld and mobile transceivers. Typically repeaters are sited or located on high points so as to maximise coverage, but there might still be localised "black spots" or "holes" in the coverage.

As repeaters are intended primarily to service mobile and handheld stations it is polite to give priority to these users should you hear them.

A repeater is a sophisticated device that simultaneously receives and transmits signals. Clearly, to do this the repeater has to utilise 2 frequencies, one to receive the incoming signal and a second to re-transmit, in real-time, the incoming signal. This means that you have to set-up a transceiver to handle this **split frequency** operation.

How you set up individual radios is beyond the scope of these notes but in essence, the process is as follows:

1. Tune your radio to the correct channel; this will be the repeater's transmit or output frequency. As an example the local 2m Mendip repeater GB3WR has an output frequency of 145.600MHz FM, so to use this repeater you would tune your radio to 145.600MHz.
2. Select the repeater offset so that when you key up or press the PTT (push to talk) switch the transmit frequency is shifted from the repeater output to the repeater input frequency. In the case of GB3WR, the input frequency is 145.000MHz FM which is 600kHz below the output frequency making the offset -600kHz. Note that all 2m repeaters have the same -600kHz offset but this is not true of other bands particularly 70cm where different offsets are applied.

There is a third step that concerns how to set your radio to access the Repeater. Almost all, if not all, repeaters in the UK require a signal that tells the repeater that you wish it to activate and re-transmit your signal.

This is achieved by using a CTCSS (Continuous Tone Controlled Squelch System) sub-audible tone. This is a tone that sits at or below the audible frequency range that your transceiver injects onto your signal. The repeater, on receipt of the correct sub-audible tone, will activate and re-transmit the incoming message but will ignore signals that have the wrong sub-audible tone or no sub-audible tone.

The purpose of the sub-audible tone is to prevent a signal being received by two repeaters using the same frequencies activating both repeaters. CTCSS tones are set regionally so that, in theory, all repeaters in a geographic area use the same CTCSS sub-tone and adjoining regions use different tones to avoid co-channel activation.

3. So the final step in setting up your transceiver is to activate the CTCSS system and select the correct sub-audible tone. In the case of GB3WR this sub-tone is 94.8Hz

So to summarise:

1. Tune to the repeaters output frequency (GB3WR output 145.600MHz)

2. Set the offset to the transmit frequency (GB3WR input 145.000MHz offset -600kHz)
3. Switch on the CTCSS sub-tone and select the correct sub-tone frequency (GB3WR 94.8Hz)

Most modern radios know the frequencies allocated to repeaters and automatically select the correct offset when tuned to the repeater out frequency range. Additionally, most have memories that can store output frequencies, input frequencies, splits and sub-tones to simplify repeater operations, this is particularly useful on 70cm where the offsets are not consistent and cannot be automatically set.

Typical Analogue Repeaters			
Band	**Repeater Outputs**	**Repeater Inputs**	**Offset**
10m (28MHz)	29.62 - 29.70MHz (RH1 - RH8) 10kHz channel spacing	29.52 - 29.59MHz (RH1 - RH8)	-100kHz
6m (50MHz)	50.71 0 50.89MHz 10kHz channel spacing	51.21 - 51.39MHz	+500kHz
4m (70MHz)	No repeaters	No repeaters	N/A
2m (144MHz)	145.5935 - 145.7935MHz (RV48 - RV63 12.5kHz channel spacing	144.990 - 145.1935MHz (RV48 - RV63)	-600kHz
70cm (430MHz)	430.8250 - 430.9750MHz (RU66 - RU78) 25kHz Channel Spacing	438.4250 - 438.5750MHz (RU66 - RU78)	+7,600kHz
	433.0000 - 433.3750MHz (RB0 - RB15) 25kHz channel spacing	434.6000 - 434.9750MHz (RB0 - RB15)	+1,600kHz

When calling through a repeater CQ calls aren't used; it is more usual to say something like "**M7XYZ listening through**" or "**M7XYZ testing access**". It is not correct to provide someone with a signal report when working through a repeater; you are not giving a signal report for the other person's signal but a signal report for the repeater which is meaningless. Similarly, you don't exchange QSL cards for contacts via a repeater since

you are confirming contact with the repeater not the other person and repeaters don't send QSL cards!

When using a repeater the transmit time is limited, all repeaters have a time-out function. This is set to 3 minutes in most cases (but might be different on some repeaters) and is designed to prevent the repeater from being locked into constant transmission. When you are using a repeater you should ensure that the transmit timer is reset at the start of every over which is usually signified by one or two pips, failure to do this will result in the timeout timer continuing and the person on the second or third over being left with no transmission time.

Repeater input and output frequencies are reserved for repeater use and simplex operation on the input or the output frequencies should be avoided.

7C2

Recall that users of FM and Digital Voice (DV) should check that the channel is not in use by other modes.

Recall that such checks are not 100% reliable.

Some systems can coexist with analogue FM which means that users of both systems have to be aware of each other which is not always possible. Many Digital sets have the ability to switch to FM so can check the channel using both modes, but analogue FM only sets are more limited. Monitoring with the squelch fully open to detect the other signals can assist but is not 100% reliable.

Connecting input devices to transmitters

7D1

Recall that connecting anything other than the supplied microphone to the transmitter requires the correct operation of the PTT line and that the audio signal levels are correct.

Changing microphones can result in changes to the performance of your transmitter. Most transmitters are matched to their supplied microphones and changing this can result in lower or more probably higher input audio signals reaching the transmitter.

To overcome this and prevent overdriving the transmitter and avoiding adjacent channel interference it is necessary to adjust either the output from the microphone or, if that adjustment is not possible, adjust the amount of amplification provided to the incoming signals. Clearly, in the latter adjustment, there is a need to be able to adjust the amount of amplification back if the original microphone is brought back into use.

A similar situation can arise if the microphone is replaced with an adapter to take audio tones from a computer since the input and output levels of the soundcard are unlikely to be compatible with the standard microphone levels. Usually, it is possible to adjust the levels from within the software being employed to generate the tones but if not some form of attenuation or amplification might be needed as part of the interface.

Where possible an external soundcard is a better way of dealing with digital tones as this avoids the possibility of accidentally transmitting the alert sounds that computers play when a TWEET, EMAIL or error is encountered.

When using microphones that were not originally intended for the make/model of the transmitter that you are using make sure you check the wiring and PTT action, a wrongly wired microphone or digital interface can result in the transmitter being locked in transmit as soon as it is plugged in.

Where accessories such as digital interfaces are being employed make sure that suitable screening is present to avoid the connecting leads picking up stray RF and interfering with the PTT sensing causing inadvertent transmission or locking transmit out.

Codes and abbreviations

7E2

Recall the meaning of the RST code, the number of divisions of each of the three items, and their order of merit.

Signal reports are one of the most common pieces of information to exchange between radio amateurs and there is a recognised system for exchanging this information. It is broken down into:

- **Readability** - A measure of the clarity or understandability of the transmission. This is not to be confused with strength, it is perfectly possible for a weak signal to be fully readable. This can be subjective and the value is up to the individual receiving the signal.
- **Strength** - A measure of how strong a signal is. Most transmitters have some sort of signal strength meter built into them, and although this is rarely calibrated it offers a good guide. FM signals will have a constant signal strength while AM and SSB signals will vary with the speech so you'll need to watch it and give an average reading.
- **Tone** - Only employed when reporting on a Morse or CW signal (although it is sometimes used in digital modes) this measures the quality of the tone associated with the dits and dahs. In modern transceivers anything less than a tone of 9 is unusual.

The two components (or three in the case of a CW/data signal) are relayed as a pair or trio of numbers in the correct order Readability - Strength - (Tone) using the following scale:

Signal Reports					
Readability		**Signal Strength**		**Tone**	
Value	**Meaning**	**Value**	**Meaning**	**Value**	**Meaning**
1	Unreadable	1	Faint, barely perceptible	1	Extremely rough note
2	Barely readable	2	Very weak	2	Very rough note
3	Readable with difficulty	3	Weak	3	Rough note
4	Readable with little difficulty	4	Fair	4	Fairly rough note
5	Totally readable	5	Fairly good	5	Note modulated with strong ripple
		6	Good	6	Modulated note
		7	Moderately strong	7	Near DC note but with smooth ripple
		8	Strong	8	Good DC note with a trace of ripple
		9	Very strong	9	Pure DC note

A fully readable very strong voice signal would be reported as 59 or sometimes "5 and 9". There is a tendency, especially in contests, to report 59 every time, but it is more valuable to give an honest or accurate report.

Digital interfaces

7F1

Recall that there are Digital Voice (DV) and Digital Data (DD) modes available and that different systems may not be compatible.

Recall that appropriate radio equipment is needed for each of these digital systems.

Recall that DV radios may embed the call sign and this will need to be considered if using borrowed equipment.

Digital Voice (DV) and Digital Data (DD) covers systems such as D-Star (Icom/Kenwood), Fusion (Yaesu C4FM) and DMR (Originally Motorola but available from a variety of manufacturers). Many of these systems are vendor-specific and not compatible with each other, so check on the infrastructure available before committing to the equipment.

A lot of the digital systems embed a callsign in the radio settings and use this to identify the user on the network. If you borrow a digital transceiver before you use it make sure that it contains your callsign information and not anyone else's otherwise you may break the Licence Conditions by incorrectly identifying your station.

Satellites

7G1

Recall that amateur satellites operate in allocated frequencies within the Amateur bands.

Recall that terrestrial operation on satellite frequencies should not take place.

The band plans show where frequencies are used to transmit to (earth to space) or receive from (space to earth) orbiting satellites including the International Space Station (ISS).

On the 2m band, allocations are currently:

- 145.200MHz Earth to Space
- 145.800MHz Space to Earth
- 145.806 - 146.000 Satellite Exclusive

You should only use these allocations for their intended purpose of satellite communications and not for normal QSOs that don't involve satellites.

7H1

Recall that other Administrations (foreign countries) do not routinely recognise the Foundation Licence.

The Foundation Licence is valid in the United Kingdom of Great Britain and Northern Ireland, the Isle of Man and the Baliwicks of Jersey and Guernsey (including Alderney and Sark). This also covers the territorial waters and the air overhead.

The Foundation Licence does not come with any sort of automatic international recognition, and you cannot operate in foreign countries without prior approval from the licensing authorities in the country of interest.

This does not prevent you from contacting the licensing authorities in a foreign country and asking if you can be allowed to operate during your visit, but the decision or approval will come on a case by case basis and may not be automatically given. The operating callsign will be created if an approval is be given.