

ACMA recognition certificate (Foundation) Syllabus and examination information

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Introduction

The ACMA recognition certificate (Foundation) is the entry-level qualification for amateur radio in Australia.

It allows people to operate an amateur station on a limited set of frequencies (foundation frequencies).

The syllabus and related examination for the ACMA Foundation recognition certificate reflects the minimum level of knowledge, skills and experience required to:

- > safely assemble an amateur station
- > operate it safely on the foundation frequencies
- > not cause interference to other users and services.



Operating an amateur radio with a Foundation qualification

Follow the operating conditions set out in:

- > the [Radiocommunications \(Amateur Stations\) Class Licence 2023](#) (known as the Amateur Class Licence)
- > the [Radiocommunications Licence Conditions \(Amateur Licence\) Determination 2015](#) (known as the Amateur LCD) – for beacon or repeater station operation
- > the [Radiocommunications Act 1992](#).

Syllabus: ACMA recognition certificate (Foundation)

Notes:

- > Examination candidates will be supplied with reference materials to facilitate some of the assessment requirements. Materials may include look-up tables, formulas, diagrams, photographs, relevant class licences or licence condition determinations, and physical examples.
- > Under the column 'Assessment objective', the syllabus uses the following words to denote the differing levels of answer required:
 - > **Recall** indicates the requirement to recall a fact and apply it directly to the assessment question or situation. This may include using the supplied reference material.
 - > **Understand** indicates the need for more detailed knowledge of the subject.
 - > **Demonstrate** indicates that the candidate is required to carry out a physical task.
 - > **Identify** indicates that the candidate is required to identify particular objects, diagrams or other matters from a supplied set.
- > Reference to a 'transceiver' means a combined transmitter and receiver.
- > Reference to 'harmful interference' means as defined in the [Australian Radiofrequency Spectrum Plan](#).

Section	Topic	Assessment objectives
1. Nature of amateur radio		
1.1	Nature of amateur radio	Recall that amateur radio is intended to facilitate the hobby of radiocommunications.
1.2	Types of licences	Recall that amateur radio activities are authorised under the Amateur Class Licence and the Amateur LCD for beacon and repeater stations. Other forms of licences authorise different types of radiocommunications, such as citizens band (CB), land mobile, point-to-point links and broadcasting. Recall that the amateur service operates on frequency bands allocated for amateur use. Recall that the amateur service shares some frequency bands with other services.
1.3	Allocation of frequency bands	Recall that services, such as broadcasting, aeronautical and maritime services, are allocated frequency bands appropriate to their purpose.

Section	Topic	Assessment objectives
2. Licence conditions		
2.1	Amateur conditions	Recall that operation of an amateur station is subject to conditions in the <i>Radiocommunications Act 1992</i> , the Amateur Class Licence and the Amateur LCD for beacon and repeater stations.
2.2	Purpose of the amateur service	Recall that the Amateur Class Licence primarily authorises the operation of an amateur station for self-training in radiocommunications, intercommunication between amateurs and technical investigations into radiocommunications.
2.3	Communications by amateur stations	Recall that, except in relation to a distress or emergency situation, or participating in emergency services operations or training exercises, the Amateur Class Licence only authorises amateur-to-amateur communications.
2.4		Recall that messages may be passed-on on behalf of third parties as long as they are not used for financial gain or reward.
2.5	Distress and urgency signals	<p>Recall that distress communications are signalled by the use of 'MAYDAY' and that these communications have priority over all other communications.</p> <p>Recall that anyone hearing a 'MAYDAY' communication is responsible for passing the information on to an appropriate authority.</p> <p>Recall that some urgent situations not warranting the use of 'MAYDAY' are signalled by the use of 'PAN-PAN'.</p> <p>Recall that these communications should receive priority and should be reported to an appropriate authority.</p>
2.6	Station identification	<p>Recall that correct station identification is required at the beginning and end of a transmission and at least every 10 minutes during transmissions.</p> <p>Recall that any transmission, even a test transmission, must contain station identification.</p>
2.7	Amateur call signs	<p>Identify from supplied reference material, the categories of call signs used in the Australian amateur service.</p> <p>Recall all sign suffixes applicable to each licence category, prefixes and state designators.</p>
2.8	Encoded messages	Recall that the transmission of messages that are encoded to obscure their meaning is not permitted except for the purposes specified in the Amateur Class Licence.
2.9	Authorised frequency bands and emissions	Recall the Amateur Class Licence authorises operation on certain frequency bands. Recall in which document the bands are specified.
2.10	Permitted power output	Recall the maximum transmitter output power permitted under the Amateur Class Licence.

Section	Topic	Assessment objectives
2.11	Notification of change of contact details	Recall that an operator should notify the Australian Communications and Media Authority (ACMA) of any change of contact details.
2.12	Harmful interference	Recall that a person must not operate an amateur station if operation causes harmful interference to other licenced services.
2.13	Use of amateur stations	Recall that an amateur station cannot be used for financial gain.
2.14		Recall that only people with suitable qualifications may operate a station.
2.15		Recall that a person without amateur qualifications may communicate via an amateur station, provided the station is always under the full control of a qualified person.
2.16	The ACMA may obtain information or documents	Recall that the ACMA has the power to request information from an amateur, including evidence of their qualification.
2.17	Restriction of operation to avoid interference	Recall that the ACMA has the right to restrict the operation of an amateur station to avoid harmful interference.
2.18	Use of the Amateur Class Licence and Amateur Class LCD	Identify the specific amateur conditions in the Amateur Class Licence/Amateur LCD for operating an amateur station on foundation frequencies.
2.19	Station security	Recall that an operable amateur station must not be accessible to unauthorised people.
3. Technical basics		
3.1	Units of measurement, abbreviations and multiple/sub-multiple prefixes	Recall the units of, and abbreviations for voltage, current, resistance and power. Recall the engineering prefixes milli, kilo and mega.
3.2	Meaning of DC and AC	Recall what is meant by the abbreviations DC and AC.
3.3	Audio and radio frequencies	Recall, using supplied reference material, the range of frequencies described as audio frequency (AF) and radio frequency (RF).
3.4	Meaning of AM and FM	Recall what is meant by the abbreviations AM and FM. Recall how the radio frequency carrier is modified for AM and FM.

Section	Topic	Assessment objectives
3.5	Meaning of voltage, current, resistance and power	Recall the meaning of voltage, current, resistance and power.
3.6	Simple calculations	Recall, using supplied reference material, the relationship between voltage, current, resistance and power. Calculate an unknown value given the value of the remaining components.
3.7	Excessive and incorrect polarity	Recall that electronic circuits can be damaged by applying an excessive voltage or voltage of wrong polarity.
3.8	Unit of frequency	Recall the unit of frequency.
3.9	The sine wave	Recall the graphic representation of a sine wave and that sine waves are produced by oscillators.
3.10	Mains electricity supply	Recall the voltage and frequency of the mains electricity supply used in Australia.
3.11	Range of human hearing	Identify, from supplied reference material, the range of frequencies for normal human hearing.
3.12	Audio frequencies used in radiotelephony	Identify, from supplied reference material, the range of audio frequencies commonly used in radiotelephony.
3.13	Frequency ranges for HF, VHF and UHF	Identify, from supplied reference material, the frequency bands for HF, VHF and UHF.
3.14	The relationship between frequency and wavelength	Recall the relationship between frequency and wavelength. Convert from one to the other using supplied reference material.

4. Transmitters and receivers

4.1	Block or 'concept' diagrams of simple transmitters and receivers	Identify, using supplied block diagrams, the names of the stages in a simple transmitter and receiver.
4.2	Importance of proper transmitter adjustment	Recall that improper adjustment of a transmitter can cause harmful interference to other radiocommunications services, both inside and outside the frequency bands allocated to amateurs.
4.3		Recall that all components of transmitter emissions must be contained within the radiofrequency bands allocated to amateurs.

Section	Topic	Assessment objectives
4.4	Identification of waveforms	Identify, with the aid of supplied diagrams, a radio frequency carrier waveform, an audio frequency waveform and a modulated waveform.
4.5		Identify, using supplied block diagrams, where the carrier, audio and modulated waveforms occur in a simple transmitter.
4.6	Types of amplitude modulation	Recall that single sideband (SSB) is a form of amplitude modulation (AM).
4.7	Transmitter output matching	Recall that the final power amplifier stage of a transmitter must be connected to a correctly matched transmission line and antenna to avoid possible damage to the transmitter and/or cause interference to other radiocommunications services.
4.8	Effect of AF gain control on output modulation	Recall the need to ensure microphone gain, where fitted, is correctly adjusted to avoid over-modulation of AM or FM transmitters.
4.9	Effects of over modulation	Recall that excessive modulation of transmitters may cause distorted output and interference to adjacent frequencies.
4.10	Transceiver controls	Recall the purpose of the following controls: AF Gain, RF Gain, Squelch, Mode, VFO, RIT, Band and Carrier control.
4.11	Receiver terms	Recall the meaning of the terms: sensitivity, selectivity and stability as they apply to a receiver.

5. Transmission lines and antennas

5.1	Types of transmission lines	Identify from a supplied diagram, photograph or physical examples, common co-axial and balanced transmission lines. Recall their typical characteristic impedance.
5.2	Co-axial connectors	Identify, from a supplied diagram, photograph or physical examples, co-axial connectors commonly used in radiocommunications.
5.3	Testing of transmission lines	Understand the reason for continuity and insulation testing a co-axial cable terminated with co-axial connectors. Recall the continuity and insulation testing procedure.
5.4	Antenna purpose	Recall that the purpose of an antenna is to convert electrical signals into radio waves, and vice versa.
5.5	Antenna length to frequency relationship	Recall the relationship between the physical length of the antenna and the frequency of operation.
5.6	Identification of common antennas	Identify, from supplied diagrams, a half-wave dipole, folded dipole, 1/4 wave vertical ground plane, Yagi, and end-fed half-wave antenna.

Section	Topic	Assessment objectives
5.7	Choice of antenna	Recall that the on-air performance of an amateur station can be improved significantly by the correct choice of antenna. Identify, using supplied reference material, the symbol for an antenna.
5.8	Antenna directional characteristics	Recall the meaning of the terms: polarization, omni-directional, bi-directional, unidirectional and gain as they apply to antennas.
5.9	Polarisation	Recall that the polarisation and directivity of an antenna is determined by its physical construction and orientation.
5.10	Effective radiated power (ERP)	Recall that ERP is the product of transmitter power and antenna gain. Recall that antenna gain is generally expressed in decibels.
5.11	Antenna matching	Recall the need to match an antenna to a transmission line and to minimise the Voltage Standing Wave Ratio (VSWR).
5.12	Antenna tuning unit	Recall the uses, purposes and adjustment of a typical manual ATU.
5.13	Baluns	Recall that when feeding a balanced antenna with an unbalanced transmission line (co-axial cable), the preferred practice is to use a balun.
5.14	Voltage standing wave ratios (VSWR)	Recall the correct placement, use and adjustment of an VSWR meter.
5.15	Acceptable VSWR	Recall that an VSWR equal to, or less than, 1.5 indicates a satisfactory antenna match.
5.16	Testing transmitters	Recall that when testing a transmitter, a non-radiating load (dummy load) is commonly used to prevent a signal from being radiated.
6. Propagation		
6.1	Propagation basics	Recall that radio waves travel in straight lines, unless diffracted, reflected or refracted.
6.2	Effect of distance on radio waves	Recall that radio waves get weaker with distance as they propagate from the antenna.
6.3	Communication range	Recall that communication range at VHF/UHF is dependent on antenna height, a clear path, transmitter power and receiver sensitivity.
6.4	Effect of obstacles and structures on VHF and UHF signals	Recall that VHF and UHF signals are obstructed by hills and large structures.

Section	Topic	Assessment objectives
6.5	Long distance communications on VHF and UHF	Recall that unusual atmospheric conditions may at times provide extended range.
6.6	The ionosphere	Recall, using supplied reference material, that the ionosphere comprises layers of ionised gas at varying heights above ground.
6.7	Factors affecting HF propagation	Recall that ionospheric propagation is dependent on time of day, season, frequency and solar activity.
6.8	Ionospheric refraction	Recall that long-distance HF communication relies on propagation by ionospheric refraction.

7. Interference

7.1	Sources of radio interference	Recall that broadcast radio and television receivers can suffer interference from local sources, including electrical and electronic equipment and high voltage electricity supply lines, as well as from radiocommunications transmitters.
7.2		Recall that interference to other radiocommunications services, including broadcast radio and television reception, can be caused by the faulty operation of radiocommunications transmitters.
7.3		Recall that radiocommunications transmitters can be the source (but not necessarily the cause) of interference to nearby electronic and radio equipment. Recall that technical solutions can generally resolve the interference.
7.4	Interference and electromagnetic compatibility (EMC)	Recall that the ability of electronic or radio equipment to operate properly, without interference, in the presence of electromagnetic radiation, such as radiocommunications transmissions, refers to the EMC of the equipment. This is also known as the equipment's radiofrequency immunity.
7.5	Interference pathways	Recall that radiocommunications transmissions that are the source of interference, may be induced into nearby electronic or radio equipment through conduction along electrical mains wiring or from direct pickup by the equipment.
7.6	Amateur transmissions and EMC	Recall that interference resulting from EMC problems may be dependent on the power, frequency and type of emission of the radiocommunications transmitter and its distance from the affected equipment.
7.7	Antenna location and EMC	Recall that interference resulting from EMC problems can be minimised by careful selection and siting of antennas.
7.8	Transmission modes and interference	Recall that some transmission modes are more likely than others to cause objectionable interference to broadcast radio and television reception and to telephones.

Section	Topic	Assessment objectives
7.9	Filters	<p>Recall that the immunity of most types of equipment can be increased by fitting suitable filters in external cabling, such as antenna, power supply or interconnections between equipment.</p> <p>Recall that the filters should be fitted as close to the affected devices as possible.</p>
7.10	Simple 'choke' filter	Recall how to construct a simple RF 'choke' filter using a ferrite rod or toroid.
7.11	RF earthing	<p>Recall that the function of the RF earth connection in an amateur station is to provide a path to ground to minimise RF currents entering the mains earth system and causing interference to other electronic equipment.</p> <p>Identify, from supplied diagrams, the symbol representing an earth connection.</p>
7.12	Diplomacy and EMC	Recall that EMC problems have the potential for causing neighbourhood disputes. Understand the need for diplomacy, the sources of advice available and the role of the ACMA.
7.13	Harmful interference	Recall that a licensee must not operate an amateur station if its operation causes harmful interference to radiocommunication services.

8. Operating practices and procedures










8.1	Equipment practices	Demonstrate connecting a transceiver safely to a power supply, microphone, VSWR meter, antenna matching unit, transmission line and antenna.
8.2	Knowledge of the frequencies and emissions that may be used under an ACMA recognition certificate (Foundation)	<p>Recall the relevant band plans, frequencies and emissions that may be used by the holder of an ACMA recognition certificate (Foundation) under the Amateur Class Licence.</p> <p>Recall that amateur band plans, by agreement, play an important part in managing interference between amateur stations.</p> <p>Relevant reference material will be supplied.</p>
8.3	Requirement not to transmit on frequencies in use	Recall and demonstrate the requirement to listen on a frequency before transmitting to ensure that interference will not be caused to other stations using the frequency.
8.4	Operating practices	<p>Demonstrate, by making on-air contacts using appropriate calling procedures, the correct operation of HF and VHF/UHF transmitter/receivers.</p> <p>Demonstrate the use of a signal strength meter to make meaningful signal reports.</p>
8.5	Operating through a repeater	Recall and demonstrate, using supplied reference material, the correct use of voice repeaters, including the use of continuous tone-coded squelch system (CTCSS) and dual tone multiple frequency (DTMF) access control systems.

Section	Topic	Assessment objectives
8.6		Recall and demonstrate the need to leave adequate breaks between transmissions when using voice repeaters.
8.7	Making a 'CQ' call and changing to a working frequency	Demonstrate an all-stations (CQ) call on HF and VHF/UHF, making a contact and initiating a change of frequency (QSY) from the calling channel to a working channel.
8.8	Abbreviations	Recall that there are internationally recognised abbreviations commonly used in communications.
8.9	Transmitter measurements	Recall and demonstrate the measurement of the output power of a transmitter. Measure the VSWR using a suitable measuring device.
8.10	Correcting simple equipment maladjustments	Recall and demonstrate the correction of simple problems such as high VSWR, excessive modulation, and excessive RF output power.
9. Safety		
9.1	Dangerous voltages	Recall that high voltages and high currents are dangerous.
9.2	Electrical safety – equipment to be approved	Recall that any mains-operated equipment sold, hired or supplied must be approved by an electricity authority or other relevant authority. Recall that approved equipment will have an approval label.
9.3	Awareness of state electricity authority requirements	Recall that it is necessary to check relevant requirements regarding unqualified people wiring and testing mains-operated equipment. This includes leads, plugs and sockets connected to the household mains supply.
9.4	Electrical earthing	Recall why most mains-operated equipment should have a safety earth connection.
9.5	Fuses	Recall that fuses prevent excessive currents that may cause heat damage or fires.
9.6	Correct fuse to be used	Recall that a correct fuse must be fitted to all electrical equipment.
9.7	Replacing fuses	Recall the precautions to be taken when replacing faulty fuses including the selection of a fuse rated in accordance with an equipment manufacturer's specifications or the requirements of an electricity supply authority.
9.8	Station layout for physical safety	Recall that the layout of an amateur station should take account of physical safety issues. Recall that trailing cables are trip hazards and dangerous.
9.9	Power-lead safety	Recall that frayed or damaged power leads are dangerous and should be replaced or repaired by an authorised person.

Section	Topic	Assessment objectives
9.10	Know location and desirability of a Mains OFF switch	Recall the desirability for a clearly marked switch to turn off all station equipment in an emergency.
9.11	Actions to be taken in the event of an accident involving electricity	Recall that, in the event of an accident involving electricity, the first action is to safely switch off the power.
9.12	Electric shocks	Recall that a casualty of electric shock must not be touched unless the power has been switched off.
9.13	Call for help – use of resuscitation techniques	Recall that emergency services need to be called immediately and that cardiopulmonary resuscitation (CPR) may need to be administered.
9.14	Battery safety	Recall that batteries contain chemicals and emit fumes and may explode if punctured or exposed to flames or sparks.
9.15	Antennas and safety	Recall that it is important for all people (and animals) to be kept at a safe distance from antennas.
9.16	Radio waves can be dangerous	Recall that electromagnetic radiation (EMR) can be dangerous and higher frequencies and power levels and proximity to the source increase the danger.
9.17		Recall that a safe distance from an antenna depends on the ERP, operating frequency, antenna type and orientation.
9.18	Antenna erection	Recall that antenna erection is potentially dangerous and should be carried out by suitably qualified people.
9.19	Securing and siting antennas	Recall that antennas and their fittings must be suitably located and secured and must never be connected to, or sited close to, mains poles and lines.
9.20	Lightning protection	Recall that it is good practice to install lightning protection on antennas, disconnect antennas from any radio equipment before a thunderstorm and never operate an amateur radio during a thunderstorm.
9.21	Safe use of headphones	Recall that excessive volume when wearing headphones can cause damage to human hearing.

Examination information

1. The examination comprises:
 - a) a multi-choice question paper:
 - > 25 questions covering theory and regulations
 - > questions may be drawn from all parts of the syllabus except for section 8.
 - b) a practical component to demonstrate operating knowledge and skills:
 - > assessment will be based primarily on section 8 of the syllabus, and may also address matters in sections 2 and 9 of the syllabus.
2. Where possible, the practical component will be carried out under actual operating conditions.
3. Candidates will be supplied with reference materials to facilitate some of the assessment requirements.
4. The examination may be undertaken in one session or as part of a course of training.
5. Thirty (30) minutes is allowed for the multi-choice paper when the examination is undertaken at one session.
6. An ACMA recognition certificate will be issued to candidates who correctly answer 70% (18/20) or more of the multi-choice questions and demonstrate competence in all elements of the practical component of the examination.
7. The following symbols may be used in the examination:

Description	Symbol
Cell	
Battery	
Fuse	
Lamp	
Resistor	
Switch (SPST)	
Antenna	
Earth	
Microphone	
Loudspeaker	