

Report on RCF Examinations in 2010

Overall Results

The number of examinations held and overall results are shown in the table.

	Foundation	Intermediate	Advanced
Number of Examination sessions	605 (643) (614) (616) (640)	239 (260) (265) (206) (230)	121 (155) (169) (95) (154)
Number of Candidates	1896 (2021) (2003) (1965) (2034)	652 (704) (733) (646) (625)	321 (426) (397) (289) (446)
Number of Passes	1605 (1704) (1678) (1605) (1719)	596 (662) (677) (603) (604)	222 (289) (263) (161) (326)
Pass rate	84.7 (84.3%) (83.8%) (87.4%) (84.5%)	91.4 (94.0%) (92.4%) (93.4%) (96.6%)	69.2 (67.8%) (66.2%) (64.1%) (73%)

The top set of figures is for 2010 with previous years down to 2006 shown in brackets. The number of candidates and number of examinations is down on 2009 but the average number of candidates per exam remains remarkably constant. Most clubs operate some form of demand led arrangement and where there are hall hire fees there is a minimum economic number to run a course.

Pass rates, that is the percentage of students passing, remain reasonably stable. It should be noted that the number of candidates is the number registering, a few of whom may not turn up to sit the examination. The pass rate for those actually sitting the exam will be one or two percent higher.

Analysis of Tally sheets

Foundation

The table shows the percentages of correct answers to questions in the various sections of the syllabus.

1&2	Licensing Conditions	85.3
3	Technical Basics	82.8
4	Transmitters & Receivers	76.5
5	Feeders & Antennas	83.4
6	Propagation	83.6
7	Electromagnetic Compatibility	83.3
8	Operating practice & procedures	86.7
9	Safety	91.6
	Overall	83.8

Comments

This result represents a small improvement on 2009 in every section.

The poor result in sub-section 2c.5 (55% correct answers) suggests that the syllabus change to allow foundation licensees to supervise other UK amateurs has not yet fully percolated down to candidates.

Some candidates failed to distinguish the range of human hearing from the more limited range adequate for amateur voice transmissions; and some did not know which bands are classified as HF, VHF and UHF.

Questions on modulation which refer to the signal from the microphone being “placed” on the carrier confused a minority. Diagrams showing audio, carrier, and amplitude modulated waveforms were not well understood. Many thought over-modulation would damage the transmitter (and some, understandably – given the cost of transmitters - thought this more serious than spilling onto adjacent channels). A minority are still having problems with the term “detector” and think this is the stage which either detects that a signal is present or separates the wanted radio signal from the rest. Some are not clear about the difference between separating the wanted radio signal from other unwanted radio frequency signals and separating the audio and RF components of a wanted signal.

The difference between antenna polarisation and polar pattern of radiation is still not well understood.

Propagation questions were fairly well answered except that some did not know that VHF signals get weaker with distance even when Tx and Rx have a clear view of each other.

Several did not realise that ferrite rings to block interference need to be sited as close as possible to the affected apparatus, or possibly thought the interference directly affected the loudspeakers of hi-fi equipment rather than ran down the leads to the amplifier.

The sections on Operating and Safety were quite well answered with no significant anomalies.

Intermediate

The percentages of correct answers in the various sections of the syllabus were

Licensing Conditions	85
Technical Basics	76
Transmitters & Receivers	73
Feeders & Antennas	80
Propagation	80
Electromagnetic Compatibility	79
Operating practice & procedures	83
Safety	91
Construction & Measurement	81
Overall	81

Comments

Those questions which required both a change in the Regional Secondary Locator and use of the correct optional suffix were poorly answered. The correct meaning of -/P causes difficulty to candidates. Exactly who the User Services are is not well understood. The poor outcome of 2f.1 questions was because candidates tended to prefer the ethical answer rather than the requirements of the licence.

Some of the exams in 2010 were conducted to the old syllabus; because of the extensive renumbering of Technical Basics questions there is some difficulty in relating question numbers on the tally sheets to questions in the bank. Where this is possible there is evidence that sub-multiple units (e.g. Milliamp) are not well understood, possibly because decimal notation is also poorly grasped. The difference between primary and secondary cells was not well understood. The new questions on alternating current (3f.1 to 3f.4) were least well answered.

The purpose and use of keying filters in CW transmitters was not well known. Although questions about mixing frequencies (4c.1) were well answered, those about the details (4f.1, 4g.1, 4h.1) caused difficulties. The meaning of "detector" was still a problem.

In the section on Feeders and Antennas the difference between polarisation of the transmitted signal and polar diagram of the antenna was still causing confusion.

In the Propagation section, skip distance and skip Zone (or dead zone) continued to cause problems.

The need for self-imposed power limitation when operating in an urban environment was not fully appreciated. There was some doubt about the type of transmissions that could produce herring-bone interference patterns on TV screens. The meaning of "direct" pick-up was not well understood.

The only noticeable deficiency in the Operating section was lack of knowledge where to find the frequencies used by satellites.

The Safety section was well answered.

The sole shortcoming in the Construction section was a lack of ability to identify resistors by their colour codes.

Advanced

The percentages of correct answers in the various sections of the syllabus were

Licensing Conditions	86
Basic Electronics	64
Transmitters & Receivers	62
Feeders & Antennas	57
Propagation	74
Electromagnetic Compatibility	67
Operating practice & procedures	78
Safety	81
Measurement	75
Overall	69

Comments

Overall this represents a small improvement over 2009.

In the licensing section there were two ambiguous questions (2g.1-005 and 2i.1-011); making allowance for these would raise the correct answers to 88%.

Two new questions on EMF and internal resistance proved too difficult for many. Impedance calculations involving vector addition were not well answered. Other subjects causing problems were the relation between frequency and period, impedance transformation in transformers, the PIV requirement of rectifier diodes, and the higher smoothing requirements of half-wave rectification.

In the transmitter section the precise role of the transistor in an oscillator was not well understood. Questions about multiplying from VHF to microwaves that involved calculations were not well answered. Other areas of difficulty were the production of unwanted frequencies in mixer oscillators, deviation ratio and the distinction between narrow and wide band frequency modulation, the effect of audio compression on average power output, the causes of "chirp", curing parasitic oscillations, and the effect of overdriving an external power amplifier.

In the receiver section poor areas included the definition of receiver selectivity, the result of front-end overloading, the beneficial effect of IF tuned circuits in overcoming the distortion produced by AGC bias, criteria for choice of IF frequency and for local oscillator frequency in a MW radio, the effect of modulation occurring on the local oscillator, and the purpose of a product detector.

Answers about dipole length often failed to allow for end correction – and some forgot that a dipole is a half-wavelength antenna! The perimeter length of a quad antenna again caused a problem. The fact that a tri-band three element Yagi would have 12 traps was not well understood. Return loss questions were again poorly answered.

A minority had problems with MUF but Section 6 was reasonably well answered considering the complexity of some questions.

Some candidates have problems with passive intermodulation products, others with the distinction between cross-modulation and mixer products, or the correct location of ferrite

rings on hi-fi speaker leads. Some did not know whether a quarter-wave stub to act as a shunt notch filter should be open or closed at the far end.

The Band Plan recommendation against voice modes on the 10 MHz band was not well known.

Safety questions presented no obvious anomalies.

A question about a meter shunt was poorly answered but this seemed likely to be due to poor arithmetic rather than incorrectly applying the principle involved. Interpretation of an oscilloscope display caused problems, complicated in one case by the need to convert from peak to RMS value.

Overall comments

To maintain the high standard of examination items it is important to bring challenges to the attention of the Examination Committee. This is done, either by a comment on the irregularity form or by subsequent letter or e-mail to the RCE Department at RSGB Bedford. Tutors are encouraged to ask candidates how the exam went and to report any comments that give rise to concern.

The Examination Committee is most grateful to tutors and invigilators for completing the Tally sheets. Their analysis serves two purposes. It enables production of this report, which it is hoped will be of benefit to tutors and it allows each question to be assessed for efficacy. Of course one would hope safety questions will be well answered, but any departure from the 'norm' does trigger a more careful look at the question concerned.

The EC also wishes to express its thanks to the tutors, examination officers and invigilators for their considerable efforts in running courses and providing examination facilities.

Previous reports and reports from the Standards Committee are maintained on the RCF web site, linked from the RSGB tutors web pages. Feedback on the reports is warmly welcomed and should be sent to the RCE Dept at RSGB. Rce.dept@rsgb.org.uk

Examination Committee March 2011