

# Appendix 3

## FRCR Examinations

The examination regulations for First FRCR and Final FRCR Examinations are available on the Royal College of Radiologists website [www.rcr.ac.uk](http://www.rcr.ac.uk).

### 1. First FRCR Examination

#### 1.1 Overview

The First FRCR assesses knowledge of the sciences underpinning clinical oncology. There are four modules:

- Radiation physics
- Medical statistics
- Clinical pharmacology
- Cancer biology and radiobiology.

There is a single paper of single best answer (SBA) question paper for each module. There are 180 questions in total, divided between subjects as outlined in the table below.

Subject	Number of SBA Questions	Duration
Cancer Biology & Radiobiology	50	2½ hours
Clinical Pharmacology	40	2 hours
Medical Statistics	40	2 hours
Physics	50	2½ hours

The examination is held twice a year, usually in March and September. Candidates may enter the examination at any four consecutive sittings. They may enter for any combination of subjects at each sitting. There is no requirement to retake a module once a pass in that subject has been achieved.

Guidance to candidates is available at:

<http://www.rcr.ac.uk/content.aspx?PageID=73>

#### 1.2 Question and standard setting

Prior to each examination, the pass mark for each of the four modules is defined by a panel of examiners. These examiners are clinical oncology consultants who are not involved in setting examination questions on this occasion to ensure clinical relevance and independence. The process of criterion referencing is performed and for each question a score is defined based on the probability of the 'just passing' candidate achieving a correct answer.

The questions are blue-printed against the curriculum to ensure the competences are fairly represented and the examination is valid.

The discrimination index is available for all questions at the time of setting the examination to ensure that the examination is fit for purpose. In each module a number of questions are repeated from previous sittings and compared with their actual performance. This allows assessment of consistency in criterion referencing and validation.

Each question is analysed after the examination as to its performance. The discrimination index for each question is calculated. Those with a value  $>0.4$  are considered good questions and re-enter the bank; those with a value  $<0.2$  are considered bad questions and discarded or re-written; those between 0.2 and 0.4 are reviewed and often modified before returning to the bank.

The reliability of the examination is kept under review. The overall performance of trainees in the examination is after each sitting.

### **1.3 Feedback to trainees and trainers**

The results of the examination are published within three weeks of the examination. Candidates who are unsuccessful receive details of their mark in each module together with the Pass Mark for that sitting.

Following each examination sitting a formal Examiners' Report is produced for each module to help trainees and their trainers in preparing for future sittings. In particular, the reports emphasise areas from that particular examination which were poorly answered. This is circulated to all examination candidates, Regional Specialty Advisors, Training Programme Directors and College Tutors. Reports for the last 10 years examinations are available at:

<http://www.rcr.ac.uk/content.aspx?PageID=78>.

### **1.4 Selection and training of examiners**

The total term of office for First FRCR examiners is five years. Applications are invited and examiners are appointed with a view to maintaining a 'balanced' Examination Board, taking into account the requirements for specialist expertise in each module, geographical distribution of training schemes and clinical practice backgrounds.

Examiners must be:

Either:

- Specialists in one of the subjects examined in the First FRCR examination (Physics, Radiobiology, Cancer Biology, Clinical Pharmacology) as evidenced by a substantive appointment in an oncology training centre or university who are:
  - actively involved in teaching at FRCR or MSc level
  - experienced in the processes of postgraduate examinations
  - prepared to undertake training in the examination procedures of the Royal College of Radiologists
  - able to demonstrate that they have undergone appropriate equality and diversity training and are willing to abide by good practice in these areas when examining
  - able to devote time to question setting, standard setting, examining, preparing for examining and attending Examining Board and other examination meetings

Or:

- Fellows of the Royal College of Radiologists by examination who are:
  - consultant clinical oncologists practising within an approved UK training scheme with a minimum of 3 years from appointment
  - actively involved in the training of clinical oncology specialty registrars
  - prepared to undertake training in the examination procedures of the Royal College of Radiologists

- able to demonstrate that they have undergone appropriate equality and diversity training and are willing to abide by good practice in these areas when examining
- able to devote time to question setting, standard setting, and attending Examining Board and other examination meetings

On appointment examiners will be allocated to one of the module groups and attend as observers the Examination Board meeting and question revision and setting meetings prior to becoming designated examiners for any sitting of the examination. An induction package provides examiners with an outline of the examination processes and the procedure for question writing, revision and selection together with criterion referencing. All examiners undergo a teaching session to give them an opportunity to write questions and have them peer-reviewed.

## **2. Final FRCR**

### **2.1 Overview**

The Final FRCR examination provides an independent assessment of the knowledge and skills that trainees are expected to possess on completion of intermediate specialist clinical oncology training. It comprises three components:

- a single best answer examination (2 papers each with 120 questions and lasting 3 hours)
- a clinical examination (5 stations each lasting 8 minutes)
- an oral examination.

The clinical scenarios chosen in each element are selected by experienced clinical oncology consultants as representative of clinical practice. The examiners are drawn from different centres, representing practice across the United Kingdom. The examination is independent of the practice in any individual centre and the standard chosen reflects a broad spectrum of clinical opinion. The examination is blueprinted against the curriculum ensures that the full curriculum is sampled, so that the broad knowledge and skills required from a trainee at this point in their training are assessed.

The Single Best Answer component is delivered at a number of local centres as this is efficient and cost-effective for candidates. The oral and clinical components are delivered in a single centre for logistical reasons, including the need to ensure that each candidate is assessed by more than one team of examiners, helping to ensure consistency for all candidates and minimising the price of the examination to the candidate.

Performance in each component of the examination is independently assessed, without reference to the other components. Each component of the examination carries equal weight in determining the overall result. A less than satisfactory performance in one component may be offset by a better performance in another. In the course of the entire examination the candidate will be assessed by at least 10 examiners, all of whom are consultant clinical oncologists.

### **2.2 Question and standard setting**

The three elements of the Final FRCR (SBAs, Oral and Clinical) are mapped to separate blueprints which relate to the curriculum to ensure that the competences being assessed are fairly represented.

### 2.2.1 Single best answer question papers

The SBA Papers assess knowledge required to manage patients with cancer. The questions are blueprinted sampling across the full range of the curriculum for intermediate specialist clinical oncology training. The breakdown of questions by tumour site reflects the clinical importance of the diseases in clinical oncology practice and currently is as follows:

Tumour type	Number of questions per examination sitting
Breast	24
Lung	24
CNS	12
Lymphoma	12
ENT	24
Urology	24
Upper Gastrointestinal	12
Lower Gastrointestinal	24
Gynaecology	24
Skin	12
Miscellaneous	48

Sample SBA questions are available for the candidates on the College website.

The pass mark is set using the Modified Angoff technique of criterion referencing. The quality of the SBA paper is evaluated by examining the Cronbach alpha coefficient with a target level of 0.8. Question quality is evaluated by examining the 33% discrimination index and high quality questions are re-used. Once the pass mark for the SBA has been set, grades B-E are given at one standard deviation above and below this mark with C being the grade required to pass the examination.

### 2.2.2 Clinical examination

The clinical examination in the final FRCR tests the skills of candidates in examining patients appropriately and detecting the presence or absence of physical signs. They are further required to interpret physical signs and to develop an appropriate differential diagnosis and management plan.

The clinical examination lasts for 40 minutes and candidates rotate around five "stations", spending eight minutes at each station and covering the common physical systems. Prior to the start of the session the examiners confer and agree the clinical signs that the candidate is expected to elicit. The examiners also determine the appropriate questions and identify the pass-fail elements of the station. These are then verified by the Chairman of the Examination Board and the Senior Examiner to ensure consistency.

At each station candidates are examined by a different pair of examiners, marking independently. For each station candidates are marked by each examiner employing a four-point grading system which is in transition from a letter-based to numerical system:

Descriptor	Numerical grade	Letter grade
Clear Fail	1	E
Bare fail	2	D
Bare pass	3	C
Clear Pass	4	B

Each Candidate will receive a numerical score between 10 and 40. Candidates scoring less than 20 out of 40 are given an overall grade of “E”. The pass mark is 27 out of 40 and scores between 25 and 28 are discussed at the final examination board meeting. Likewise the score for achieving an overall grade of “B” is set at 33. In borderline cases, scoring between 25 and 28, the detailed scoresheets are discussed at the final Examination Board Meeting. This is to ensure consistency and accuracy of marking and then a final grade is assigned.

### **2.2.3 Oral examination**

The oral component affords the opportunity to discuss complex issues with the candidate and to observe their performance of complex procedures such as interpreting radiological images, pathology reports and other clinical material. They can be observed outlining tumours volumes or normal structures on radiological images and they are invited to interpret and, if appropriate, to modify radiotherapy treatment plans. The Examiners jointly prepare the questions and model answers for each topic. They agree an objective marking scheme, which identifies the elements required to pass the station.

The examination comprises eight pre-prepared “question topics” to test the full range of these activities, set against a blueprint. All pairs of examiners use the same set of questions in a particular session. The stations are examined by a pair of examiners and after four stations the candidate moves to a different pair of examiners, allowing assessment by four examiners in total.

Material for each oral examination is developed in two formal full-day sessions. The examiners develop questions and model answers. They also define the criteria which identify the just-passing candidate for each question. There is further subsequent e-mail discussion and editing between examiners which refines the final question format. The pre-scripting of the examination material is intended to minimise the variability in examiners’ presentation of the material to the candidates and assessment of the candidates’ performance.

The marking scheme is similar to that described above for the clinical examination, but with eight pairs of results. Accordingly the scores will be different with the range of possible scores from 16 to 64. The pass mark is 44. The boundaries are set as grade “E” at 36 or less, “D” at 36 to 43, and “C” at 44 to 53. Overall Grade “B” is given for 54 or higher. The candidates scoring 42-46 are discussed at the final examination board meeting and a grade assigned.

Once the individual parts of the examination have been taken a Grade is assigned to each element as described above. A candidate must average a Grade C in order to achieve an overall pass. This may be achieved by compensation between the different elements of the examination, i.e. a candidate’s poor performance in one element may be compensated for by a better performance in another element. Such candidates are discussed at the Examination Board meeting which follows immediately after the completion of the examination. The examiners review each element of the examination to evaluate the significance of elements where the candidate has performed poorly in terms of overall clinical competence. Borderline candidates are, also, discussed in detail at the Examination Board meeting. All examiners who have met the candidate review the candidate’s performance and debate the candidate’s strengths. On the basis of these discussions a pass/fail decision is made.

#### 2.2.4 Feedback to trainees and trainers

All candidates who fail the examination (and their Training Programme Director and College Tutor) receive a written feedback sheet which documents their score in each element of the examination and provides relevant examiner comments. Candidates from UK training schemes who fail the examination for a second time are invited to the College for a meeting with Senior Examiners. The Examiners and the candidate discuss the candidate's performance during the examination, providing feedback about individual areas for improvement. They, also, discuss the trainee's training opportunities and to identify ways to help their future examination preparation. Following the meeting a written report is sent to the candidate and his/her Training Programme Director and College Tutor.

Following each examination sitting a formal Examiners' Report is produced for each element of the examination to help trainees and their trainers in preparing for future sittings. In particular, the reports emphasise areas from that particular examination which were poorly answered. This is circulated to all examination candidates, Regional Specialty Advisors, Training Programme Directors and College Tutors. Reports for the last 10 years examinations are available at:

<http://www.rcr.ac.uk/content.aspx?PageID=86>.

#### 2.2.5 Review of the Final FRCR examination

The SBA format of examination was introduced in Autumn 2006. It has now been used on seven occasions. This form tests the core knowledge that is a prerequisite to the higher level testing in the clinical and oral elements of the examination, where skills such as treatment planning, tumour outlining, image interpretation, ethical issues and clinical judgement are tested.

In all there have been 425 attempts at the SBA component and only 19(4.5%) candidates have failed this element and subsequently passed the overall Final FRCR by compensating with above average performances in the remainder of the examination. Only 2.4% (10/425) passed the examination by compensating for a weak performance elsewhere with an excellent score in the SBA

Of the 193 UK candidates attempting the exam for the first time only 5(2.6%) have failed the SBA component and have gone on to pass by compensation in another element of the examination.

The positive (PPV) and negative (NPV) predictive values of the SBA examination for passing the examination as a whole are shown in the table below:

	<u>Pass exam</u>	<u>Fail exam</u>	<u>PPV</u>	<u>NPV</u>
<u>Pass SBA</u>	243	46	84%	
<u>Fail SBA</u>	19	117		86%
Total	262	163		

This demonstrates the quality of the SBA component as a discriminator for performance in the Final FRCR examination. The Specialty Training Board of the Faculty of Clinical Oncology has accepted a proposal of the Examination Board of the Final FRCR to change the Final FRCR by separating the SBA component of the examination from the remaining elements. The SBA examination will be Part A of the Final FRCR and passing this examination will be a pre-requisite for entry into Part B, which will comprise the clinical and oral elements of the current examination. The Board considered that the SBA tested essential knowledge and which is a

prerequisite to the knowledge and skills that are assessed in the oral and clinical exams and therefore should be a prerequisite to the other elements, rather than allowing them to be taken in any order. When a candidate has passed the part A examination, the pass will remain in force for 2 years and 3 months. The Examination and Specialty Training Boards felt that, if a candidate had not been successful during this time frame, the inevitable evolution of the subject would require a re-examination of the knowledge required to proceed in the subject.

The proposed part B examination will be constructed on the same basis as at present. The numerical scoring system will be used, however, and the pass mark will be set on the basis of the combined score. Since there are five clinical and 8 oral stations this will reduce the contribution of the clinical examination to the overall score. The Specialty Training Board believes that this fairly reflects the reduction in the importance of clinical examination in the specialty compared to technical knowledge and performance.

### **2.2.6 Appointment and training of Examiners**

The total term of office for examiners is six years. Applications are invited from Fellows of the Royal College of Radiologists (see below). In considering the applications, cognisance is taken of the need for a balanced Examining Board, which is as representative as possible of site specialised interests, clinical practice backgrounds and the geographic distribution of training schemes.

Examiners must be Fellows of the Royal College of Radiologists by examination who are:

- consultant clinical oncologists practising within an approved UK training scheme
- actively involved in the training of clinical oncology specialty registrars
- prepared to undertake training in the examination procedures of the Royal College of Radiologists
- able to demonstrate that they have undergone appropriate equality and diversity training and are willing to abide by good practice in these areas when examining
- able to devote time to question setting, standard setting, examining, preparing for examining and attending Examining Board and other examination meetings

A period of time during the first year is spent training in examination procedures and contributing to the development of material, before beginning active face-to-face examining.

#### **2.2.6.1 Single Best Answer paper**

In relation to the SBA section of the examination, an induction package provides examiners with an outline of how to write SBA questions, a paper on SBA principles and a separate paper on standard setting and criterion referencing. All examiners undergo a teaching session to give them an opportunity to write questions and have them peer-reviewed. Subsequent questions undergo a peer review process and the criterion referencing of the examinations is conducted as a group activity. During their first examination diet trainee examiners take part in the standard setting procedure but their analysis is not included in the definitive scores for that sitting.

In order to sustain and develop the SBA component of the examination, the Examination Board convened a new SBA sub-committee which is trained to write, edit and evaluate questions for this section of the examination. This committee is chaired by an experienced examiner and members include the Chairman and Senior Examiner of the Final FRCR. Its 12 members comprise consultants and senior

specialist registrars with a broad range of clinical expertise and a wide geographical representation. Its first meeting in December 2009 was moderated by the Chairman of the Royal College of Physicians SBA Committee. It included initial induction material and tutorials on the theory and practice of effective use of SBA questions, with practical workshops on question writing and editing. This induction process will be repeated for new members as required.

#### **2.2.6.2 Oral and Clinical Examinations**

Trainee examiners observe for two diets of oral and clinical examinations and then participate in writing oral questions. Four all-day meetings are used for discussion and selection of material for the oral examinations. They also observe examinations for five days at both the Spring and Autumn diets.

They can then examine in the following oral examination. They receive tutorials in focussed oral examination question writing from the Senior Examiner and once their active role commences they receive feedback and advice on questions that they submit to the exam board as their questions are developed. New examiners develop increasing skills in question-setting and standardisation during their training period.

The new examiners do not examine candidates until they have observed two diets of the examination. This allows them to understand the level of competence expected by the College to pass the FRCR and to familiarise themselves with the time constraints and techniques needed for fair evaluation of candidates. New examiners are initially paired with senior colleagues to refine their training and to gain confidence in the process. The Chairman and Senior Examiner also observe their performance and provide informal feedback.

Examiner performance is evaluated by analysing their performance in standard-setting in SBA examinations and by comparing their performance to their paired examiner in the clinical and oral examinations.