

# The Royal College of Ophthalmologists

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FROM THE EXAMINATIONS DEPARTMENT



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## Final Report April 2011 Refraction Certificate Examination

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## **Introduction**

The fourth Refraction Certificate examination in the current format was held in Birmingham on 27 and 28 April 2011. 57 candidates presented themselves for the examination of whom 20 (35%) satisfied the examiners and passed. The examination consisted of an eight station OSCE covering a range of skills required to assess visual acuity, refractive error and the prescription of spectacles.

## **Examination blueprint**

The Refraction Certificate (RCert) is designed to assess the following learning outcomes from the Royal College of Ophthalmologists curriculum for ophthalmic specialist training (OST):

CA2	Vision
CA7	Motility
PM1	Management plan
PM14	Spectacles
PS2	Refraction
PS21	Hand hygiene
C1	Rapport
C2	Communication
C12	Records
BCS6	Optics
BCS14	Instrument technology
AER16	Time management

## **Examination Structure**

Eight OSCE stations are selected from a possible 16. Four stations are compulsory (they will appear in every examination). Four stations are selected from the remaining twelve.

### **Compulsory stations: (15 marks available for each OSCE)**

1. Cycloplegic Retinoscopy
2. Non Cycloplegic Retinoscopy
3. Subjective Refraction Sphere
4. Subjective Refraction Cylinder

### **Remaining stations**

5. Binocular Balance (15 marks)
6. A second Cycloplegic Retinoscopy (15 marks)
7. Focimetry (10 marks)
8. Lens Neutralisation (10 marks)
9. Muscle Balance with Maddox Rod (15 marks)
10. Muscle Balance with Prism Cover Test (15 marks)
11. Near Addition (10 marks)
12. A second non Cycloplegic Retinoscopy (15 marks)
13. Refraction of a Model Eye (15 marks)
14. Trial Frame Fitting and Interpupillary Distance (IPD) Measurement (5 marks)
15. Visual Acuity and Refraction Estimation (5 marks)
16. Visual Acuity Testing of a Child (5 marks)

The stations used in the April examination were:

- Station 1: Cycloplegic retinoscopy
- Station 2: Muscle balance: prism cover test
- Station 3: Non-cycloplegic retinoscopy
- Station 4: Lens neutralisation
- Station 5: Subjective refraction: modification of cylinder
- Station 6: Focimetry
- Station 7: Subjective refraction: modification of sphere
- Station 8: Testing visual acuity in a child

### **Standard setting**

Candidates must be able to accurately assess visual acuity, measure refractive error and recommend an appropriate spectacle correction to pass the RCert. The pass mark is identified using the borderline candidate method. In addition the pass mark using the Hofstee method is calculated as a comparison, but not used to decide identify the successful candidates.

### **Borderline candidate method (BCM)**

Examiners marked the station they were supervising according to the marking guidance provided. In addition they were asked to rate the candidates overall performance as a pass, a fail or borderline. The median mark allocated to the borderline candidates then becomes the pass mark for that station. The sum of the borderline marks for each station is the examination pass mark.

The pass mark for the examination is the sum of the BCM pass mark and one standard error of measurement (SEM), which is calculated after the examination results are known. The pass mark for the April 2011 examination was agreed at 71%, which is comparable to previous years.

## Results (Table 1)

Maximum possible mark	100
Mean candidate mark	66
Median candidate mark	66
Standard deviation	10
Highest candidate mark	90
Lowest candidate mark	30
Range of marks	60
Reliability	0.6
Standard error of measurement (SEM)	6
BCM pass mark	65
Hofstee pass mark	67
Pass mark used (BCM + 1 SEM)	71
Pass rate	20/58 (35%)

## Distribution of marks (Table 2)

<46	\	1
46-50		5
51-55		7
56-60		7
61-65	\	6
66-70	\	11
71-75		4
76-80		7
81-85	\	6
86-90		3
>90		0
		57

## Statistics for each station (Table 3)

	Station							
	1	2	3	4	5	6	7	8
	Cyclo Ret	PCT	Non cyclo ret	Neutralise	Subjective cyl	Focimetry	Subjective sph	VA
Max mark	15	15	15	10	15	10	15	5
Mean	8	9	9	6	10	7	13	4
Mean%	52	61	61	59	67	72	88	74
Median	9	10	10	7	11	9	14	4
Med%	60	67	67	70	73	90	93	80
SD	3.4	3.7	3.3	3.4	3.8	3.0	1.8	1.5
Max	13	15	15	10	15	10	15	5
Min	0	2	2	0	2	0	6	0
Range	13	13	13	10	13	10	9	5

Station 7 (the subjective modification of the sphere) was the easiest station.

Station 1 (the cycloplegic retinoscopy) was the most difficult station.

## Global judgments for each station (Table 4)

	Station (number of candidates)							
	1	2	3	4	5	6	7	8
	Cyclo Ret	PCT	Non cyclo ret	Neutralise	Subjective cyl	Focimetry	Subjective sph	VA
Pass	9	22	29	16	33	36	44	33
Borderline	24	14	29	23	10	10	9	14
Fail	24	21	9	18	14	11	4	10
% Pass	16%	39%	51%	28%	58%	63%	77%	58%

## Correlation between stations (Table 5)

		2	3	4	5	6	7	8
		PCT	Non cyclo ret	Neutralise	Subjective cyl	Focimetry	Subjective sph	VA
1	Cyclo Ret	0.15	0.30	0.18	0.11	0.25	0.04	0.26
2	PCT		0.05	0.18	0.24	0.03	0.04	0.09
3	Non cyclo ret			0.48	0.12	0.24	-0.07	0.09
4	Neutralise				0.32	0.35	-0.16	-0.06
5	Subjective cyl					0.20	-0.06	0.29
6	Focimetry						-0.14	-0.04
7	Subjective sph							0.12

Station 7 (subjective modification of the sphere) has generally poor correlation with all the other stations.

Stations 2, (cycloplegic retinoscopy), 3 (non-cycloplegic retinoscopy), and 6 (Focimetry) have generally reasonable correlation with the other stations.

Notably stations 5 and 7 (both subjective refraction modification tasks) have very poor correlation.

## Item discrimination and facility

33% item discrimination has a value between -1.00 and +1.00. If the candidates who score well in the examination overall score well in the station, the item discrimination index will be close to +1.00. If the candidates who score poorly in the examination overall score well in the station, the item discrimination index will be close to -1.00. Ideally the station item discrimination value should be greater than 0.400.

### Utility of each question (Table 6)

	Station	33% item discrimination	Item facility
1.	Cycloplegic retinoscopy	0.579	0.33
2.	Muscle balance	0.526	0.39
3.	Non-cycloplegic retinoscopy	0.526	0.46
4.	Lens neutralisation	0.526	0.39
5.	Subjective refraction; cylinder	0.579	0.4
6.	Focimetry	0.421	0.46
7.	Subjective refraction; sphere	0.105	0.56
8.	VA; child	0.211	0.53

Stations 7 and 8 have poor 33% item discrimination.

### Breakdown of results by training (Table 7)

	Failed	Passed	Total
In OST	19	17	36
Not in OST	18	3	21
Total	37	20	57

These differences are statistically significant ( $p= 0.026$ )

### Breakdown of results by deanery (Table 8)

Deanery	Failed	Passed	Total
East Midlands	1	1	2
London	4	5	9
Mersey	1	1	2
North West	2	2	4
Northern	1	0	1
Northern Ireland	1	0	1
Peninsula	1	1	2
SE Scotland	1	2	3
South Yorks NH	1	0	1
Severn	0	1	1
West Midlands	2	4	6
West Scotland	0	1	1
Wales	1	0	1
Yorkshire	2	1	3
Total	18	19	37

### Breakdown of results by stage of training (Table 9)

Stage (includes FTSTA)	Failed	Passed	Total
ST1	1	1	2
ST2	7	7	14
ST3	10	9	19
ST4	0	0	0
Unknown	1	1	2
Total	19	18	37

**Breakdown of results by gender (Table 10)**

	Failed	Passed	Total
Female	18	9	27
Male	19	11	30
Total	37	20	57

These differences are not statistically significant ( $p=1$ )

**Breakdown of results by country of qualification (Table 11)**

	Failed	Passed	Total
UK	16	14	30
Outside UK	21	6	27
Total	37	20	57

These differences are not statistically significant ( $p = 0.09$ )

**Breakdown of results by stated ethnicity (Table 12)**

	Failed	Passed	Total
Asian	13	7	20
Black African	2	0	2
Chinese	6	3	9
Mixed	2	1	3
Other	4	4	8
White British/Irish	6	3	9
White other	2	2	4
Unknown	2	0	2
Total	37	20	57

**Breakdown of results by number of previous attempts (Table 13)**

Attempts	Failed	Passed	Total
1 (First)	25	9	34
2	6	5	11
3	6	2	8
4	0	4	4
Any resit	12	11	23
Total	37	20	57

**Comparison to previous examinations (Table 14)**

	March 2010	July 2010	Nov 2011	April 2011
Candidates	43	47	53	57
Pass mark	69	75	74	71
Pass rate	47%	53%	42%	35%
Pass rate in OST	58%	60%	44%	47%
% Candidates in OST	67%	70%	68%	63%
Reliability	0.58	0.6	0.6	0.6
SEM	9	8	7	6

## **Summary**

In spite of the significant improvement made to the marking guides, the reliability of the Refraction Certificate remains low. The high SEM (6%) is at least in part due to the very wide variation in the performance of candidates, many of whom are very poorly prepared for the examination.

Most of the stations perform well and have a good 33% item discrimination. Notable exceptions are the subjective refraction: modification of the sphere, and VA in a child.

Candidate evaluation was very good, with most stations receiving at least 90% approval. The lens neutralisation station only received 70% approval and attracted some comments regarding the complexity of the task and the time available. This station was, however, highly discriminating between good and poor candidates (33% item discrimination of 0.526). 66% of the candidates felt that the examination was a fair assessment of their knowledge.

Candidates expressed concerns about the patient used in station 1, which proved to be a difficult station for many. The patient had cataracts, which made judgement of the retinoscopy streak a challenge.

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**June 2011**



**Evaluation:****Candidate Evaluation** (see Appendix 1 for detailed comments)

Were you treated in a courteous manner by the examiners?

**Station 1 – Cycloplegic Retinoscopy**

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
96.7%	3.3%	0	100%	0	0	98.25%	1.75%	0

**Station 2 – Muscle Balance with Prism Cover Test**

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
96.7%	3.3%	0	96.3%	3.7%	0	96.5%	3.5%	0

**Station 3 – Non-cycloplegic Retinoscopy 1**

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
96.7%	3.3%	0	96.3%	3.7%	0	96.5%	3.5%	0

**Station 4 – Lens Neutralisation**

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
93.3%	6.7%	0	100%	0	0	96.5%	3.5%	0

**Station 5- Subjective Refraction Cylinder**

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
100%	0	0	100%	0	0	100%	0	0

**Station 6 – Focimetry**

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
100%	0	0	100%	0	0	100%	0	0

**Station 7 – Subjective Refraction Sphere**

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
100%	0	0	100%	0	0	100%	0	0

**Station 8 – Visual Acuity Testing of a Child**

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
96.7%	0	3.3%	100%	0	0	98.25%	0	1.75%

Were the patients/tasks you were asked to examine/perform appropriate?

Station 1 – Cycloplegic Retinoscopy 1

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
90%	10%	0	100%	0	0	94.75%	5.25%	0

Station 2 – Muscle Balance with Prism Cover Test

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
93.3%	3.35%	3.35%	92.6%	3.7%	3.7%	93%	3.5%	3.5%

Station 3 – Non-cycloplegic Retinoscopy 1

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
96.7%	3.3%	0	96.3%	3.7%	0	96.5%	3.5%	0

Station 4 – Lens Neutralisation

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
70%	16.6%	13.4%	88.9%	11.1%	0	79%	14%	7%

Station 5- Subjective Refraction Cylinder

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
93.3%	3.35%	3.35%	96.3%	0	3.7%	94.75%	1.75%	3.5%

Station 6 – Focimetry

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
93.3%	3.35%	3.35%	100%	0	0	91.25%	7%	1.75%

Station 7 – Subjective Refraction Sphere

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
100%	0	0	100%	0	0	100%	0	0

Station 8 – Visual Acuity Testing of a Child

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
96.7%	3.3%	0	92.6%	3.7%	3.7%	98.25%	0	1.75%

## Overall Candidate Evaluation

Was the OSCE well organised?

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
93.3%	0	6.7%	96.3%	0	3.7%	94.75%	0	5.25%

Were you given clear instructions about the OSCE?

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
96.7%	0	3.3%	92.6%	0	7.4%	94.75%	0	5.25%

Did you feel that the OSCE was a fair assessment of your knowledge?

Team 1			Team 2			Overall		
Yes	No	DNA	Yes	No	DNA	Yes	No	DNA
66.7%	23.3%	10%	66.7%	18.5%	14.8%	66.7%	21%	12.3%

## Appendix 1: Candidate's comments

### Team 1

#### Candidates' Comments

##### OSCE 1 – Cycloplegic Retinoscopy 1

- Extensive cortical cataract which made the ret reflex very difficult to interpret. Previously had no problem with this station.
- Examiner calm and polite
- Examiner very pleasant, helpful
- Patient had lens opacity, which made things very difficult.
- Examiner very cold
- Examiner very courteous
- Patient appropriate but had a cataract.
- Patient not appropriate – had way too much cataract.
- Patient & examiner acted as expected for examination situation. Patient was appropriate, followed and understood instructions, but retinoscopy reflexes weren't 'easy'.
- Patient had a squint and I would have preferred to occlude to RE to ensure I'm refracting LE macular.
- Lots of cortical lens reflexes, which could be confusing.
- Ret light dim, spent significant amount of time trying to assess reflexes as a consequent given extra 20 seconds but not equivalent to time spent trying to ret after battery change during exam.

##### OSCE 2 – Muscle Balance with PCT

- Not sure whether there is ideal esophoria for this station
- Examiner very nice
- Patient not appropriate – had multiple squints.
- Examiner cold
- Courteous if a little brusque
- Patient was difficult but fair.
- Slightly vertical deviation also, but guidance for candidates does not mention combined deviation.
- Patient had hearing difficulty and initially said he didn't have double vision with glasses, but later said that he did.
- Patient had a bit of cataract.

##### OSCE 3 – Non Cycloplegic Ret 1

- Examiner gruff, not helpful, accusatory about leaving a mess
- Suitable equipment, examiner helpful. Good patient – resisted accommodation well.
- Good station.
- Patient not appropriate – young myope with lots of accommodation, quite difficult to refract, even after fogging the fellow eye.
- Took 2 minutes to get a fixation target on the screen.

##### OSCE 4 – Lens Neutralisation

- Examiner came across as a little rude. Don't need this attitude in a very stressful situation
- If the near component is not assess in bifocals would be better to give a single prescription glasses
- A large prism was in place, which was hard to hold while neutralising the lens in allocated time.

- Glasses not appropriate – large prism.
- Examiner gruff, not helpful.
- There are 3 components to do, with prism as well, 5 minutes seems very short for both lenses.
- There was not enough time to neutralise the lens, the add and the prism of both glasses in time provided. The time is enough for 2 elements but not 3.
- Very difficult in the given time. High prism.
- Glasses appropriate but I am not sure if correct prism available in tray.
- Too difficult.
- One eye is easier than two. Less time. Prisms as well!! Not regularly done in real life. Does this need to be tested for this exam?
- Large section of bifocal with prisms, tricky finding optical centre.

### **OSCE 5 – Subjective Refraction: Cylinder**

- Patient's answers in altering the axis of the cyl resulted in worsening of his vision and had to be repeated 3 times.
- Examiner very nice
- Examiner very helpful.
- Patient's responses did not correlate with improvement in VA?? Why unless it was my technique.
- Examiner was very courteous. Flummoxed by computer based test charts, but this was my first station on the circuit. Perhaps allow for this?
- Very courteous examiner
- Examiner very good.

### **OSCE 6 – Focimetry**

- The focimeter's glasses rest was broken. Better to use the European dot focimeter.
- Examiner very helpful.
- Good orientation of the station.
- Focimeter not in perfect working order.
- Broken focimeter stand!!

### **OSCE 7 – Subjective Refraction Sphere**

- Examiner again very courteous. Very good patient, understood instructions well. Fair station.
- Patient very nice and cooperative.

### **OSCE 8 – Visual Acuity Testing of a Child**

- Lovely little girl. Very well behaved and followed instructions well.

### **Fair assessment of knowledge comments:**

- Time restraints and complex cases made it difficult to come up with an answer in allocated time.
- In some areas, time is limiting factor.
- Not a fair assessment – very difficult cyclo station and muscle balance station.
- Not a fair assessment – very specific. More appropriate for optometry trainees especially with regard to prisms.
- Examiner very helpful.
- Difficult adjusting to some equipment (used to different ones).
- Broadly speaking yes, although technical matters knocked my confidence despite the orientation period.
- It is a very artificial situation to keep assessing different patients in a short period of rather than a complete patient.

- Not very relevant e.g. lens neutralisation. 5 mins is too short. A complete refraction is a better assessment as time can be adjusted accordingly to the difficulty at a particular step. Hurrying through stations doesn't simulate natural/regular clinical situation, 5 mins too short in a few stations.
- Time should be extended to 6 mins.
- Knowledge yes but the time given was too short for some stations.
- Lens neutralisation station – time challenge: ?one glass lens or two

**General Comments:**

- Felt that the cyclo retinoscopy case with cataract (++) cortical) was unfair as poor reflex and feel that other circuits with difficult patient would be much better/easier.
- Exam would be fairer if I had one patient to perform full refraction on.
- Increase time available for each station.
- Please could results be available earlier than 4 weeks after the exam.
- The exam was very well organised.
- Rather than 2 stations at a time so have to read both sets of instructions, may be 2 circuits.
- Fair exam.
- Started slightly late.
- More time for lens neutralisation.
- Time = not enough.

## Team 2

### Candidates' Comments

#### OSCE 1 – Cycloplegic Retinoscopy 1

- Examiner was very helpful to show me the equipment.
- Examiner and patient are helpful and friendly

#### OSCE 2 – Muscle Balance with PCT

- Small hypertropia, patient ?can fuse sometimes
- A bigger deviation would have been better!
- Patient unable to tell when diplopia abolished.
- Hypertropia not obvious, but still able to ret.

#### OSCE 3 – Non Cycloplegic Ret 1

- Patient had good reflex.
- Friendly patient.

#### OSCE 4 – Lens Neutralisation

- Very helpful examiner.
- 5 mins for 2 lenses is inappropriate when you are only asked to ret 1 eye at a time in the same time.
- Not enough time for neutralisation of both glasses.
- With a minute to go, I realised that the lens introduced to me as +ve and –ve were actually –ve and +positive.
- Helpful examiner. 5minutes not enough for both sides, suggest one side enough.
- Very helpful examiner. Prism lenses out of order.
- Very nice examiner.

#### OSCE 5 – Subjective Refraction: Cylinder

- Examiner showed me around the equipment, enough time for familiarisation. The patient was very cooperative.
- Not sure that patient was appropriate – my exam showed a wide range of cyl accepted by the patient.
- Friendly patient.

#### OSCE 6 – Focimetry

- Too little time to do both near and distance prescription.
- One of the lenses seemed scratched to me; and then I realised it wasn't bifocal.
- Suggest to check one side enough as 5 mins not enough for both side.

#### OSCE 7 – Subjective Refraction Sphere

- Helpful patient.

#### OSCE 8 – Visual Acuity Testing of a Child

- Very clear explanation from the examiner.
- Patient confused a few letters, T for F, until I rechecked with other similar sized characters.
- Able and clever girl.

### **Fair assessment of knowledge comments:**

- Not a normal clinical environment (stress). Should be a WpBA not exam.
- Too little time.
- Need to increase time to 7-8 minutes per station.
- Not really sure.
- I think I could've done better but that is exams for you!

### **General Comments:**

- Very helpful examiners.
- The time pressure meant that I did not perform to the best of my ability.
- Need more scrap paper/clearly available space for rough working. Overall very well organised exam.
- It may be useful to have the trial lenses on the left side when refracting the left eye.
- Brief talk before each station was extremely helpful.
- The time is not enough.
- It would be better there's a set pass mark rather than the pass mark decided by how other people perform.
- The examiners were universally helpful, as were the patients. I find the 'new' examination structure a little artificial in its division of refraction into bite-sized components. Correcting sphere and cyl independently I suspect do not a refractionist make.
- The location of the exam was not clear, 'centre for visual sciences' is not on the front of the building.
- Focimetry, lens neutralisation and cycloplegic retinoscopy were bad.
- Need more time in focimetry and lens neutralisation station, or just ask for one eye. 7 mins for difficult stations.
- Enough time for familiarising myself with the equipment.
- Not enough time for lens neutralisation without focimeter.
- Please could the results come out earlier than 4 weeks as if we need to re-sit it is much better to plan ahead if we need to?
- 4 minutes is way too quick to perform some of these stations.
- 5 minutes not enough for some station esp. focimeter and lens neutralisation. Suggest doing one side enough.