

**The Royal College of Ophthalmologists**

**Refraction Certificate Examination**

**Covid Virtual Exam**

**Instructions to Candidates**

## **The Examination**

The College provides an assessment of competence in refraction, which is a requirement for trainees in specialty training in ophthalmology. The certificate must be passed in order to proceed from stage 3 to stage 4 of training.

The assessment method selected for the Refraction Certificate Examination is:

- Multi-station objective structured clinical examination (OSCE)

## **Preparation for the examination**

This is a practical examination and candidates cannot expect to be successful if they have not had extensive practice and experience of refracting patients. It is essential, therefore, that candidates are given tuition and practice many complete refractions under the supervision of an optometrist/senior trainee/consultant.

## **Aims of the examination**

The Refraction Certificate Examination is designed to assess some of the following skills from the curriculum for ophthalmic specialty training, which can be viewed in detail at: <http://curriculum.rcophth.ac.uk/>.

### **CA2 Assess vision**

- All trainees must be able to assess visual acuity for near and distance using an appropriate method and interpret the results.
- They must be aware of and be able to interpret and apply newer methods of assessing visual acuity when they are introduced into clinical practice.
- They must be able to test colour vision using an appropriate method and interpret the results.
- They should also know the principles of the assessment of contrast sensitivity.
- They must be able to assess vision in children and in adults who have language and other barriers to communication.
- They must be able to assess vision in circumstances outside the hospital outpatient clinic environment.

### **PM14 To use spectacle lenses and prisms when indicated**

- All trainees must be able to identify when a patient may benefit from the use of spectacle lenses and prisms.
- They must be able to assess the type and strength of lens or prism and provide an appropriate prescription.
- They must be able to liaise with and, where indicated, seek advice from optometrists and orthoptists.
- They must be able to advise a patient on the purpose, duration and optical effects of the prescription.

## **PS2 Perform a refractive assessment and provide an optical prescription**

- All trainees must be able to assess a patient's refractive error.
- They must be able to assess a patient's spectacle lenses using neutralisation techniques and focimetry.
- They must be able to perform retinoscopy and an accurate subjective refraction and provide an appropriate prescription.
- They must be able to assess a patient's binocular co-operation and advise on whether this should be corrected optically.
- They must be able to perform an accurate cycloplegic refraction (especially on a child) and provide an appropriate prescription.

## **C1 Establish a good rapport with patients and relatives**

- All trainees must be able to establish a trusting relationship with a patient, their carers and relatives.
- They must be able to recognise when there could be problems with establishing rapport and make attempts to mitigate possible effects on the clinical relationship.

## **C11 Keep clinical records**

- All trainees must be able to keep accurate, succinct clinical records.
- They must be able to produce accurate, legible contemporaneous entries in the patient's clinical records, ensuring that all relevant information is recorded.
- They must be able to use appropriate electronic records.

## **BCS6 Optics and Medical Physics**

- All trainees must understand and apply knowledge of optics, ultrasound and electromagnetic wavelengths relevant to ophthalmic practice.
- They must have a basic understanding of medical physics.
- They must be able to use this knowledge when interpreting clinical symptoms, signs and investigations and in the practice of ophthalmic medicine and surgery.

## **Required Reading**

Candidates should be familiar with the following documents:

- The Ophthalmic Specialist Training Curriculum (<http://curriculum.rcophth.ac.uk>).
- The Refraction Certificate Examination Syllabus which is available in the Refraction Certificate Application Pack ([www.rcophth.ac.uk/examinations](http://www.rcophth.ac.uk/examinations)).
- Good Medical Practice, GMC ([http://www.gmc-uk.org/guidance/good\\_medical\\_practice.asp](http://www.gmc-uk.org/guidance/good_medical_practice.asp)).

## Objective Structured Clinical Examination (OSCE)

The OSCE consists of a series of strictly timed assessment 'stations', where different areas of competence are tested by examiners using an objective marking system.

### OSCE Stations

- Candidates will be examined on 10 OSCE stations in 5 rooms. Nine of these stations are retinoscopy stations. Candidates will perform retinoscopy on artificial eyes of varying pupil diameter.
- One examiner / invigilator will be present at each station or a group of stations during the examination.
- Each OSCE station is worth 15 marks – a total of 150 marks.
- The OSCE rooms and stations are as follows:

#### Room 1

Station 1: Simulated Retinoscopy 1 – Patient A: Right Eye  
Station 2: Simulated Retinoscopy 2 – Patient A: Left Eye

#### Room 2

Station 3: Simulated Retinoscopy 3 – Patient B: Right Eye  
Station 4: Simulated Retinoscopy 4 – Patient B: Left Eye

#### Room 3

Station 5: Simulated Retinoscopy 5 – Patient C: Right Eye  
Station 6: Simulated Retinoscopy 6 – Patient C: Left Eye

#### Room 4

Station 7: Simulated Retinoscopy 7 – Patient D: Right Eye  
Station 8: Simulated Retinoscopy 8 – Patient D: Left Eye

#### Room 5

Station 9: Simulated Retinoscopy 9 – Patient E: One Eye as directed  
Station 10: Lens Neutralisation with or without a focimeter

## Timetable

An example of the timetable for a cycle of the examination is set out below:

	Invigilator 1	Invigilator 1	Invigilator 1	Invigilator 2	Invigilator 2
	Simulated Ret 1 & Simulated Ret 2	Simulated Ret 3 & Simulated Ret 4	Simulated Ret 5 & Simulated Ret 6	Simulated Ret 7 & Simulated Ret 8	Simulated Ret 9 and Lens Neutralisation
	10 MINUTE ORIENTATION				
10 Minutes	Candidate 1	Candidate 2	Candidate 3	Candidate 4	Candidate 5
	Candidate 1	Candidate 2	Candidate 3	Candidate 4	Candidate 5
5 minutes	Start orientation				
5 minutes	ORIENTATION				
10 Minutes	Candidate 5	Candidate 1	Candidate 2	Candidate 3	Candidate 4
	Candidate 5	Candidate 1	Candidate 2	Candidate 3	Candidate 4
5 minutes	Start orientation				
5 minutes	ORIENTATION				
10 Minutes	Candidate 4	Candidate 5	Candidate 1	Candidate 2	Candidate 3
	Candidate 4	Candidate 5	Candidate 1	Candidate 2	Candidate 3
5 minutes	Start orientation				
5 minutes	ORIENTATION				
10 Minutes	Candidate 3	Candidate 4	Candidate 5	Candidate 1	Candidate 2
	Candidate 3	Candidate 4	Candidate 5	Candidate 1	Candidate 2
5 minutes	Start orientation				
5 minutes	ORIENTATION				
10 Minutes	Candidate 2	Candidate 3	Candidate 4	Candidate 5	Candidate 1
	Candidate 2	Candidate 3	Candidate 4	Candidate 5	Candidate 1
5 minutes	Reorganise Room				

- At each station, the examiner will remind the candidate of the time available and the signals used to indicate the timing. There will always be a one minute warning before the end of each station.
- The timing of the station will be strictly adhered to. The examiner is NOT permitted or expected to provide timing prompts once the OSCE station has started so should not be asked.
- Candidates MUST complete their answers within the allotted time. The i-Pad will automatically lock the answers after 10 minutes.

## **Mark Allocation**

- 10 i-Pad mark screens in total will be completed by each candidate i.e. one mark (Answer) screen per OSCE station, 10 stations.
- For each station, each mark counts towards the final overall score.
- There are 15 marks for each OSCE.
- The maximum total score for the examination is 150.
- Whether they pass or fail, all candidates will receive a break down of their exam marks for each station. There is no other feedback provided on technique in the current exam format.

## **Standard Setting for the OSCE**

The pass mark for each sitting of the Refraction Certificate will be calculated using the Hofstee Method.

## **Overall Result**

To pass the Refraction Certificate examination, candidates must achieve a score that exceeds the numerical pass mark.

Candidates who fail the examination will need re-sit the entire examination.

## **Notification of Results**

The results of the examination will be released four weeks after the final day of examinations.

Final results will be sent to candidates by first class post and the pass list will be displayed on the College website. Examiners and candidates are not permitted to telephone the College for examination results.

## **Appeals**

A copy of the College's Appeals Procedure is available from the Examinations Department. The sole grounds for appeal are:

A candidate who has attempted Examinations or Assessments of the Royal College of Ophthalmologists may only, in the circumstances set out below, have the right of appeal against the result. The sole grounds for appeal are that:

- There is evidence of a procedural irregularity in the conduct or content of the Examination or Assessment (including administrative error) which has adversely affected the candidate's performance.

**Please note** that examples of a procedural irregularity include the invigilator not allowing the full allotted time for the examination (i.e. starting late but finishing on time), evidence of bias or obvious mistakes in the exam.

Please note, appeals will not be accepted on the grounds that a candidate considers his/her efforts were under-marked, that the candidate did not understand or was unaware of the Examination or Assessment Regulations or because the candidate seeks to question professional or academic judgment.

## Structure of the OSCE

- Candidates will be rotated through each of the 5 rooms during the examination, possibly starting in room 1,2, 3, 4 or 5. The Examinations Staff will direct each candidate to their starting station.
- Before entering each room, candidates will be able to review the relevant answer sheets for the stations in that room. The answer sheets contain detailed instructions to candidates. All 10 answer sheets can be viewed on-line in advance of the examination. ([www.rcophth.ac.uk/examinations](http://www.rcophth.ac.uk/examinations)). The answer sheets look slightly different to the appearance on the iPad but contain the same information, questions to be answered and marks per question.
- On entering each room there will be time for familiarisation with the room lighting, the fixation targets and lenses. (Please note that colours of lenses are not standardised; do not assume that red is positive and black is negative, although positive lenses will always be on the right side of the trial lens box). Candidates are responsible for ensuring the lenses are correct prior to starting the station. Candidates may read the patient information sheet during this time.
- Once all candidates are ready, the timekeeper will announce the start of the station.
- In the retinoscopy stations (Rooms 1, 2, 3, 4) - both eyes (2 OSCEs) must be assessed within 10 minutes. Candidates are permitted to divide the 10 minute period between the eyes as they wish. In room 5 the two OSCEs again need to be completed within 10 minutes and the candidate may again use this time flexibly.
- At the end of the OSCE station the candidate will leave the room and be directed to the next room where they can review the answer sheets for their next stations.
- The start and finish of each station is controlled precisely by the i-Pad. Once you press the button to start the exam and internal clock will start. The i-Pad will provide a 9 minute warning and at 10 minutes will lock itself and no further answers can be input.
- Irrespective of the room / station, the candidate MUST complete both OCSEs and answer-sheets within the 10 minute period allowed.
- The OSCE times will be strictly enforced and no further data is allowed to be entered after the end of the OSCE. Please bear this in mind during your practice.
- Time is scheduled to allow for moving between rooms and for examiners to complete the marking.



## Answer (Mark) iPad Screens

- In each OSCE station, you will need to fill in an answer screen on an i-Pad. Please be careful to fill out this screen correctly and in particular for the correct eye. For example, the LEFT eye retinoscopy needs to be written on the answer sheet for the LEFT eye.
- Either a negative or positive cylinder format is acceptable.
- All dioptric powers should be input to two decimal places (e.g. +0.50 not +0.5).
- On pressing the input box to enter your answer you will see a drop-down menu of tens, units and decimal place numbers. You need to press one number for each column (tens, units or decimal) to complete your answer. This can be changed at any time during the 10 minutes allowed for the OSCE and makes entry of answers much swifter.
- A + or – sign should be input. If no sign is pressed it will be assumed that this is a positive number.
- The near component in the lens neutralization OSCE is entered as an ‘add’ lens. In the answer box you will only need to enter the amount of ‘addition’ you have found to the distance prescription, e.g. enter +2.00 in the near boxes for each eye.
- Any prismatic component found in the lens neutralisation station will be recorded as if the total amount and direction of prism is in the left spectacle lens only.

## Rooms and Equipment

- The artificial eyes are in a room with trial frames, lenses, and other equipment necessary to complete the station. If you cannot identify what you need, please ask the examiner for help.
- All trial frames will be the metal Oculus Universal Trial Frame as illustrated below:



- The host examination centres provide streak retinoscopes. Candidates are permitted, and strongly encouraged, to bring and use their own retinoscopes. Many prefer to use an instrument that they have been able to use in their own training. It is advisable to ensure that your retinoscope is working and is fully charged or has spare batteries.
- It is important that you are comfortable with the room set up, the lighting, and access to the artificial eyes for the task that is set for you. If something appears to be missing, incorrect or not working, ask the examiner for help. It is best to do this during the familiarisation minutes before the OSCE time starts.

- In some examination rooms, there may be limited options to adjust the lighting. If you find the lighting unsuitable, ask the examiner to help. The examiner will alter the lighting if possible but remember that all candidates will be working in the same conditions.

## **Detailed advice to candidates for each OSCE station**

### **Retinoscopy Stations:**

- You cannot use a trial frame for simulated retinoscopy 1 & 2.
- For simulated retinoscopy 3-9 a trial frame is provided for you to use if you wish.
- Trial frames can be pre-fitted for simulated retinoscopy 3-9, however NO lenses can be preloaded before the start of the station.

### **Patient information sheet:**

- A sheet with a protractor on it is provided for simulated retinoscopy 1 & 2.

### **Answer-screen:**

- There is a separate answer screen for each eye. Each answer sheet should be completed according to the following scheme:

Question 1 asks you to write down your gross retinoscopy, i.e. without making any adjustment for working distance.

- You may use any positive or negative sphero-cylinder format for this question. A power cross format is also acceptable. Other formats will not be accepted.
- If you work with a lens equal to your working distance in a trial frame – you will need to combine the numbers (your “corrected power” and the working distance lens) to answer this question.

Question 2 asks you to write down your usual working distance and what this equates to in dioptric power. (For example, a working distance of 66 cm equals +1.50 Dioptres, and one of 50cm equals +2.00 Dioptres).

Question 3 asks you to make an appropriate adjustment from the retinoscopy result and to write a prescription, i.e. to take off your working distance.

- This is sometimes known as the “full prescription”. This should be written as a prescription, (positive or negative sphero-cylinder format).
- You should take off the working distance only.

## **Lens Neutralisation with or without a focimeter**

- You will be given a pair of glasses. These may be a pair of bifocals or contain single lenses. They will not be a pair of variable focus (Varifocals) glasses. They may have a vertical prism or have a Fresnel prism stuck on. You will not need to know the IPD or mark the optical centres to detect any prism present.
- You will be asked to measure the prescription using a focimeter or using lens neutralisation. You may choose which method. The focimeter will not be an automated focimeter.
- The type of focimeter will vary – but will look similar to this:



- Your final answer should be entered in prescription format for both eyes for distance. The near should be entered as an “add” e.g. +2.00, but this must be done for each eye. The prism size and direction should be entered for the total amount found but as if you are prescribing in the left spectacle lens only.

## **Further Advice to Candidates: Techniques, Model Answers and Common Problems.**

To pass this exam it may not be sufficient to be able to refract - you need to refract quickly and under pressure. There is no substitute for practicing upon different patients with differing prescriptions.

It is not possible to dictate, based upon current knowledge, how many refractions or retinoscopy examinations are required in order to become proficient. The best guide from candidates is that 50 to 80 refractions is common-place, and some declare over a hundred refractions.

*Some of the following advice is also given in the above instructions, but is worth repeating:*

## Retinoscopy

The practice of retinoscopy requires practise. It is not something you can master in a short time by reading books, this guide or by going on a course. There are numerous ways of obtaining an accurate retinoscopy result and the methods described below are not necessarily the only ones.

The descriptions below assume you are using a streak retinoscope.

The aim is to identify three numbers - the power of the two meridians and the axis of one (assuming regular astigmatism).

Fixation:

In non-cycloplegic retinoscopy, particularly in young phakic patients, control of accommodation is essential. The patient is asked to fix on a distant, non-accommodative target, such as a spot light, ideally 6 metres away.

In cycloplegic retinoscopy, the patient should fix on the retinoscope light.

Alignment in non-cycloplegic retinoscopy: Ideally the macular area should be refracted but this conflicts with the wish to avoid accommodation. Therefore, once the patient is fixing on the target you need to move as close to the line of sight as possible, without obscuring it. It may be helpful to instruct the patient: "tell me if I obscure your view of the (fixation) light" and then do just that – moving back to allow re-fixation. It is helpful if you can retinoscope the patients right eye with your right eye (and use your right hand), and the left eye with your left eye/hand.

With the artificial eyes used for simulated retinoscopy no fixation is possible and you should make sure you are in alignment with with the eye.

Trial frame: In this examination no trial frame will be allowed for simulated retinoscopy (1 & 2). A trial frame will be optional for simulated retinoscopy stations 3-9. If you are familiar with placing a lens equal to your working distance in the trial frame you may wish to practise holding the lenses as you might do with a child who will not tolerate a trial frame.

Retinoscopy reflex: This may be "against" or "with". A "with" reflex indicates that the optical correction required to neutralise is a convex lens (or plus lens), and an "against" reflex, a concave lens (or minus lens).

Initial reflex without any lenses, indicates if the patient is myopic (more than your working distance), or hypermetropic (or weakly myopic less than your working distance).

It is also possible to get an initial impression of any astigmatism by rotating the streak. If the streak is initially placed at axis 90 and 180 then rotate to other oblique axes. Remember that cylinder axes are often not 90 or 180.

The width of the reflex tells you how near you are to an end point. This works better for hypermetropic errors: a thinner reflex suggests a higher error and as you approach the end point the width increases.

If there is no discernable reflex, or the movement cannot be identified, the likelihood is that the patient has a large refractive error. It may be helpful to put up a +/- 6.00 dioptre lens to try and identify a reflex (occasionally even +/- 10.00).

It is helpful if you can pick an initial lens that is near to the result, and this speeds up the process. This can be judged on the uncorrected VA (if known) and the initial reflex.

Neutralising lenses: At this point practices differ in two major ways:

- 1) using spheres only or spheres and cylinders and
- 2) approaching the end point using a “with” reflex or an “against” reflex.

1) Spheres/cylinders: One option is to work in spheres only, identifying the neutralisation point of the two meridians with two different spheres. The power of the astigmatism would be the difference. This has the advantage of being simple, and avoids the problem of generating odd reflexes if the neutralising cylinder is not on axis. The axis of the cylinder can be identified using the streak and sliding up the collar. This narrows the reflex and allows you to read or estimate the axis.

The advantage of using spheres and cylinders (usually in a trial frame) is that it is possible to neutralise both meridians simultaneously. It is also possible to undercorrect the cylinder power a small amount and if not on axis, this will project the streak away from the correct axis in an exaggerated fashion. This can be used to refine the axis.

Approaching the end point: This relates to how you reach the end point. In an example of a hypermetropic error with hypermetropic astigmatism, it would be intuitive to start at zero, introducing increasing positive lenses which reduce the ‘with’ reflex towards a neutralisation point, noting the axis of the remaining cylinder, and then neutralising the second meridian.

However, if the patient had a myopic error with astigmatism, it would similarly be reasonable to reverse the argument, arriving at your neutralisation point from a different direction by adding negative lenses until the ‘against’ reflex is neutralised. In theory there is little difference, however in practice the end point is more clearly defined in the former example – to put another way, it is easier to define a neutral point when the ‘with’ reflex is followed to an end point. In a myope this can be achieved by refracting through lenses initially too strong (more myopic) to induce a “with” reflex. One danger in trying to replicate this in young myopic non-cycloplegic patients is that it might encourage accommodation.

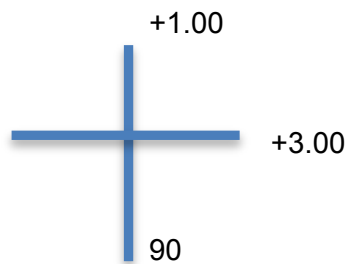
Once the readings are identified, they need to be documented clearly so that others can understand them. This is particularly important if the prescription is taken directly from a retinoscopy alone - as will happen in children and some adults.

There are three ways of doing this:

1. a power cross
2. positive cylinder format
3. negative cylinder format

A power cross is particularly useful if refraction is carried out in spheres (see above). The power cross draws out the two principal axes, and the direction can be represented by how the cross is drawn – the axis of at least one power should be documented.

Example 1



This means that when a plus +1.00 lens was held up with the streak horizontal, the power meridian is tested at 90, axis at 180, and similarly when a streak was vertical, (power meridian is now 180, axis 90) it was neutralised with a +3.00. (Note this is not the refraction as it has not been adjusted for working distance).

The same result (example 1) could equally be written:

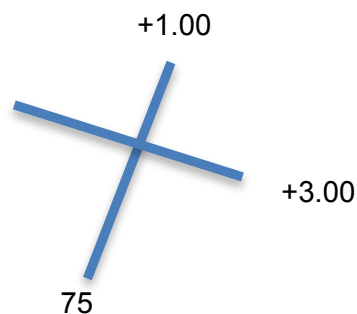
In positive cylinder format +1.00/+2.00x90 or

In negative cylinder format +3.00/-2.00x180

All three mean the same. There are three numbers present in each answer – although in the latter two the power of the cylinder has been calculated, and not in the power cross.

If the axis were oblique, a power cross would be written as below

Example 2

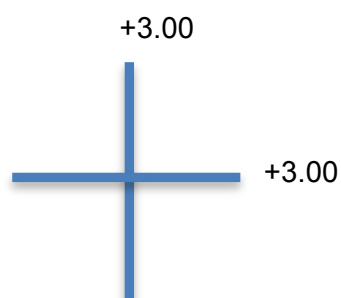


In positive cylinder format - +1.00/+2.00x75

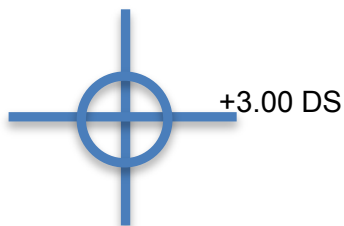
In negative cylinder format - +3.00/-2.00x165

Lastly the power cross can be used in the case of a sphere. Either write the same power on each power meridian such as:

Example 3



Or draw a circle around the base of the cross and write the power with a DS (for dioptre sphere).



In prescription format, a dioptre sphere can be written as either +3.00DS or sometimes the  $\infty$  sign is used, in which case the format would read +3.00 or  $\infty$ .

Essentially question 1 of each retinoscopy OSCE asks you to write down the retinoscopy in one of the following formats, of your choice: a power cross or in positive or negative sphero-cylinder format.

Some practise retinoscopy by placing their working distance (for example a +1.50 lens) in the trial frame. This value is then removed to commence the subjective refraction. This is not incorrect, but it can lead to confusion if you are unable to fit a trial frame.

If you prefer to carry out retinoscopy using your working distance in a trial frame you will have to add the value of the working distance onto the other lenses in the trial frame to reach the answer to answer question 1.

Please practise writing down the correct answers, in particular the retinoscopy findings, and practise taking off the working distance for the retinoscopy stations. This is commonly performed poorly.

### **Lens Neutralisation**

Please practice both focimetry and lens neutralisation.

Prisms may be difficult to assess using a focimeter, particularly in some glasses with a Fresnel prism – for which lens neutralisation is a simple method.

Please be prepared to use lens neutralisation techniques without using a focimeter