Level 6 Certificate in Contact Lens Practice

Unit 2 – Visual Optics

Principal Examiner:

J Underwood MSc BSc (Hons) FBDO (Hons) CL (Hons) SLD SMC(Tech) FEAOO CertEd

Summer 2022
Duration: 2 hours

Answer **four** questions only.

Please tick below the numbers of the questions attempted:

1 ☐   2 ☐   3 ☐   4 ☐   5 ☐

☐ Number of Supplementary Sheets used (if any), including graph paper.

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Question 1

i)   **Describe** the optics of the keratometer.
        *You should include **4** statements of fact.*   **(20 marks)**

ii)   ✏️ **Prove**, with the aid of a diagram, the keratometer
        formula.   **(25 marks)**

iii)   **Discuss** the purpose and types of doubling.   **(25 marks)**

iv)   **Explain** why a refractive index of 1.3375 is generally used for
        the calibration of the dioptric scale.   **(10 marks)**

v)   **Find** the corneal radius if the distance between the mires and
        their corneal image is 15cm, the mires are set 23cm apart and
        the power of the doubling prism is 4Δ.   **(20 marks)**

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v) **Find** the corneal radius if the distance between the mires and their corneal image is 15cm, the mires are set 23cm apart and the power of the doubling prism is 4Δ. **(20 marks)**

Question 2

An RGP contact lens has the following parameters:

BOZR   8.00mm
BVP   +3.50DS
Centre thickness   0.23mm
Refractive index   1.48

This contact lens is fitted to an eye with keratometry readings of 7.75mm along 85 and 8.05mm along 175 and shows a central clearance of 0.12mm, the refractive index of the tears being 1.336.

⌨ **Calculate**:

i)   The FOZR of the contact lens.   **(15 marks)**

ii)   The spectacle refraction at 13mm vertex distance, expressing the answer in positive sphere-cyl form, assuming the eye is fully corrected for distance vision by this contact lens.   **(45 marks)**

iii) The spectacle magnification of the system along both principal meridians, assuming the entrance pupil lies 3mm behind the cornea.   **(40 marks)**

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Question 3

i)   A soft toric contact lens is ordered empirically as
RE: -3.25DS/-2.50DC x 20. When this lens is inserted, it is seen to
rotate and stabilise in a position 10° nasally.

State the axis of the stabilised lens in the eye.   **(10 marks)**

ii)   Due to an error in ordering, the vision through this rotated lens is
poor and an over-refraction of -1.25DS/-1.00DC x 145 is required
in the trial frame, which is worn at a vertex distance of 15mm.

Assuming the final lens rotates by the same amount as the lens
above **find,** by ▤ calculation or ✎ construction methods, the
prescription of the new contact lens to be ordered.   **(90 marks)**

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Question 4

   Write short notes on any **THREE** of the following: **(100 marks)**

i)   Construction of Snellen letters and the use of the Snellen fraction.

ii)   Construction of the crossed cyl & its use in <u>verifying</u> the final prescription.

iii)   The risk of aniseikonia with contact lens versus spectacle correction in axial and refractive ametropia.

iv)   Residual and induced astigmatism and their correction with contact lenses.

   You should include 9 facts for each topic, ✎ which may include diagrams.

Question 5

i) A front surface centre-distance **solid** concentric bifocal contact lens is made to the following specification:

Distance Rx   -6.75DS
Add   +2.50DS
Centre thickness   0.15mm
Refractive index   1.47

The lens fits in alignment with the spherical cornea, which has a keratometry reading of 7.70mm. There is no apical clearance.

Find the radii required to manufacture this lens.   **(25 marks)**

ii) The same prescription is now made up as a back surface centre- distance **solid** bifocal and the outer near portion aligns with the cornea, which still has a spherical radius of 7.70mm.

If the refractive index of the tears is 1.336, **find** the new central back surface radius required.   **(25 marks)**

iii) An RGP **fused** bifocal contact lens is to be made to the following specification:

BOZR   8.20mm
BVP   +2.25DS
Reading addition   +1.75DS
Refractive indices   1.48 and 1.54

▤ **Calculate** the contact surface radius required to manufacture this lens if the segment is worked on the **back** surface.   **(30 marks)**

iv) **State** two advantages and two disadvantages of simultaneous vision (simultaneous images) bifocal contact lenses.   **(20 marks)**

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iii)   An RGP **fused** bifocal contact lens is to be made to the following specification:

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Refractive indices   1.48 and 1.54

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End of questions for this paper

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DO NOT TURN THIS PAPER OVER UNTIL ADVISED TO DO SO BY THE INVIGILATOR

Important Instructions to Candidates

Please read carefully and follow these instructions when told to do so by the Examiner/Invigilator.

1. You will be given 5 minutes at the beginning of the examination to read through the questions.

2. **Please enter your candidate number and date in the boxes on the front cover of this booklet.**

3. Please **DO NOT write your name** on the booklet. Candidates must remain anonymous for marking purposes.

4. Candidates must answer questions legibly, using blue/black ink or ball-point pen. *Pencil may be used for graphs and diagrams only.*

5. Candidates please note, the examination paper has been designed for you to answer the stated number of questions within the allotted time.

6. Candidates must read each question carefully and make sure that you know what you have to do before starting your answer.

7. Candidates must write the answer to each question in the space provided. Additional paper may be used if necessary but you must show your Candidate Number and question number(s) clearly at the top of each page.

8. Please do not write in the margins.

9. Any extra pages used should be securely fastened together using a treasury tag. This includes any diagrams, additional graph paper or any continuation paper.

10. Candidates are advised to carefully cross out any work not intended to be marked by the Examiner.

11. Please do not tear out any part of this booklet. All work must be handed in.

Important Information for Candidates

1. Answer **four** questions only.

2. Answer all parts for each question.

3. Candidates MUST work to at least 4 decimal places in ALL calculation questions and they will be penalised if this is not done.

4. Where relevant, the marks awarded for each part of a question are given in brackets, e.g. **(10 marks)**.

5. ✏ 🖩 These symbols indicate that a diagram/calculation is required or a diagram needs annotating.

6. This entire document consists of 20 pages. Any blank pages are indicated.

When told to do so by the Invigilator, you may turn the paper over and begin.