

Worshipful Company of Spectacle Makers

Level 4 Year 1 Diploma for Optical Technicians



Unit 2: The Eye and the Principles of Optics

Summer 2018

Duration: 1.5 hours

Candidate Number:

Date:

Answer ALL Questions

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

For office use only

Question number	Questions				Total	
	1	2	3	4	Marks	%
Marks						
Moderated						

Examiner's signature

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Question 2

Examiner's
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Q2a)	A thin lens of focal power +3.75 is made from plastics material CR39 of refractive index $n_d = 1.498$. Using the formula $F_d = (n_d - 1)R$ find the value of R for this lens.	(3 marks)
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Q2b)	If the refractive indices for Red and Blue light for this material are respectively n_c (red) = 1.482 and n_f (blue) = 1.501 find the focal power of the lens for each of the two colours. (Hint: Use the value of R from Q2a) and substitute the new values of n in the formula).	(6 marks)
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Q2c)	Find the focal length of the lens (in mm) for both Red and Blue light.	(6 marks)
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Q2d)	Find the difference in focal length for the two colours.	(3 marks)
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Q2e)	What type of Chromatic Aberration does this difference represent?	(2 marks)
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Question 3

Examiner's
use only

Q3a)	A concave glass surface has a radius of curvature of 60cm and is mirror coated to form a concave mirror. Find the dioptric power of the surface and its focal length in cm .	(8 marks)
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Q3b)	An object is placed 50cm in front of the mirror surface. Find the position of the image (in cm) formed by the mirror.	(4 marks)
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Q3c)	State whether this image is real or virtual and whether it is in front of or behind the mirror surface.	(2 marks)
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Q3d)	If the object is now moved to 5cm in front of the mirror find the new position of the image.	(4 marks)
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Q3e)	State whether this new image is real or virtual and whether it is in front of or behind the mirror surface.	(2 marks)
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Question 4

Q4a)	State Snell's Law for refraction at a plane surface.	(6 marks)
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Important Instructions for Candidates

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

1. Before you start to answer any question, take a few minutes to read through the paper.
2. Please ensure your candidate number and the date are in the boxes on the front cover of this booklet.
3. Please **DO NOT** write your name on this booklet. Candidates must remain anonymous for marking purposes.
4. Write your answers as clearly as you can, using a black/blue pen only. Do not use a pencil. If the examiner cannot read your writing or figures you may lose marks, or even receive no marks at all. **Pencils may only be used for graphs and diagrams.**
5. You should read each question carefully, and make sure that you know what you have to do before you start to answer.
6. You must write your answers in the space provided. Additional paper may be used, if necessary, but you must show your candidate number and the question number at the top of each sheet; not your name. You must also annotate the box on the front cover of this booklet to show how many extra sheets you used.
7. Please do not write in the margins.
8. Make sure your diagrams are as clear and neat as possible; you will get marks for doing so. If you need to draw a graph, use as large a scale as practicable; this will give the most accurate answer.
9. When answering mathematical questions, write **ALL YOUR CALCULATIONS IN FULL**. Even if you get the final answer wrong, you may get credit for the parts of the calculation that are correct.
10. After you have completed each answer, re-read the question to make sure you have answered it fully.
11. Try to leave yourself enough time to check the completed paper through before handing it in.
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