

Undergrads do questions 1-3

Grads do all questions

1. Complete the following table

Snellen Acuity (feet)	Snellen Acuity (metric)	LogMAR Acuity
20/10		
20/12.5		
20/16		
20/20	6/6	0
20/25		
20/32		
20/40	6/12	0.3
20/50		
20/63		
20/80		
20/100		
20/125		
20/160		
20/200		
20/400		

2. Find the positions of the Cardinal Points (F, F', P, P', N, N') and the positions of the entrance and exit pupils (E, E') for the Gullstrand **Accommodated** Schematic Eye.

3. Based on the results of question 2, where is the near point of the eye? Also, what is the power of the accommodated crystalline lens?

\*\*\*\*\* Grads Only \*\*\*\*\*

4. The Point Spread Function (PSF) of the eye is the squared-modulus of the Fourier Transform of the Pupil Function. In a rotationally symmetric, aberration-free system, the PSF is given by

$$\text{PSF} = \left| 2\pi \int_0^{r_{\max}} P(r) J_0(2\pi\rho r) r dr \right|^2$$

where  $r_{\max}$  is the radius of the pupil and  $P(r)$  is the transmission function of the pupil.

(a) What is the PSF for a uniform transmission function (i.e.  $P(r)=1$ ) and  $r_{\max} = 4$  mm?

(b) What is the PSF for a Stiles-Crawford apodized pupil with  $P(r) = \exp(-0.105r^2)$ . Assume  $r_{\max}$  very large for this part.

(c) Plot the results and compare the widths of the PSFs at half max.