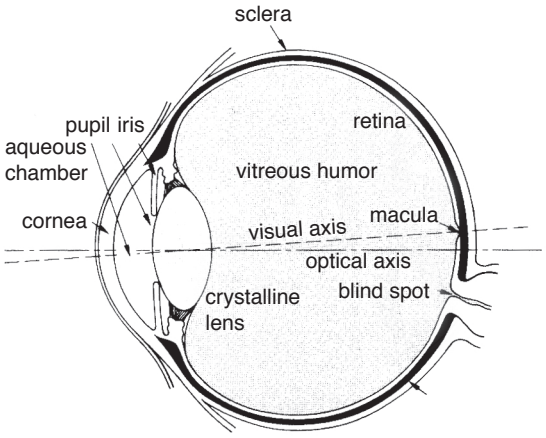
1. Human Eye **(4 pts)**

The human eye is quite complex, but in a rough approximation, a light ray travels from the outside air into a curved element, the cornea, and continues through the aqueous chamber, the eye lens and the vitreous chamber of the eyeball to the retina. Since all the tissues through which the ray travels have an index of $n_{tissue} \sim 1.37$ (± 0.03), let us assume that the space posterior to the cornea is more or less homogeneous. The object focal length is $f_o = 16$ mm.



In the approximation specified above, determine

– the approximate curvature radius of the cornea,

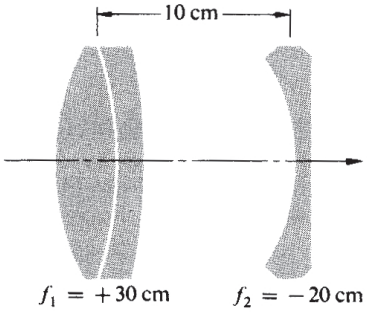
– the location of the optical center of the imaging surface with respect to the cornea's vertex and

– the image focal length of the eye.

2. Lens Combination **(4 pts)**

Hecht, Problem 5.37

Compute the image location and M_T for an object 30 cm from the front lens of the combination shown on the left, and sketch a ray diagram.



3. Laser Beam Expander **(3 pts)**

Two converging lenses serve as an expander for a coaxial Laser beam. The beam (diameter, D_{in} = 1 mm) enters the first L^+ ($f_1 = 30$ mm) and emerges from the second L^+ with $D_{out} = 8$ mm. Determine f_2 and the separation d between the lenses. Draw a ray diagram.

4. Prism and its Angle of Minimum Deviation **(4 pts)**

Plot a curve of total deviation angle δ versus entrance angle θ_{i1} for a prism with an apex angle $\alpha = 60°$ and refractive index $n = 1.52$ for θ_{i1} ranging from 30° to 90°. (Use any computer graphing method that you prefer.) From the graph determine the angle of minimum deviation δ_m and the corresponding angle of incidence $\theta_{i1,m}$ for which the minimum deviation occurs.