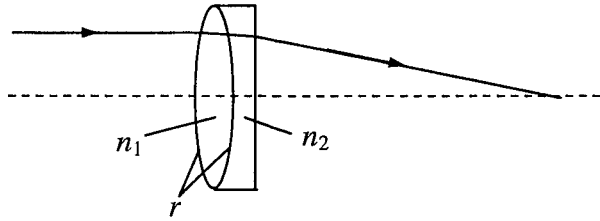


**1.** A Fraunhofer cemented achromatic doublet consists of a bi-convex positive lens of refractive index  $n_1$  in contact with a plano-concave negative lens of refractive index  $n_2$ . The curved surfaces of all the lenses have a radius of curvature  $r$ . The lens is designed to focus both red (r) and blue (b) light to the same point.



- a) If  $n_{1r} = 1.49$ , what is the focal length of the bi-convex lens for red light?
  - b) If  $n_{2r} = 1.54$ , what is the focal length of the plano-concave lens for red light?
  - c) What is the focal length of the doublet for red light?
  - d) If  $n_{1b} = 1.52$ , what must be the value of  $n_{2b}$  (the refractive index of the plano-concave lens for blue light) if the achromatic doublet is to have the same focal length for red and blue light?
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