

Q. calculate the focal length of a convex lens of crown glass (dispersive power 0.012) and a concave lens of flint glass (dispersive power 0.020) so that when placed in contact they form an achromatic combination of focal length 30cm

$$\omega_1 = 0.012$$

$$f_1 = ?$$

$$\omega_2 = 0.020$$

$$f_2 = ? \quad F = 30\text{cm}$$

$$\frac{\omega_1}{f_1} + \frac{\omega_2}{f_2} = 0$$

$$\frac{0.012}{f_1} + \frac{0.020}{f_2} = 0$$

$$\frac{0.020}{f_2} = -\frac{0.012}{f_1}$$

$$\frac{1}{f_2} = \frac{-12}{20f_1} = \frac{-0.6}{f_1}$$

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\frac{1}{30} = \frac{1}{f_1} + \left(\frac{-0.6}{f_1}\right)$$

$$\frac{1}{30} = \frac{1}{f_1} (1 - 0.6) = \frac{0.4}{f_1}$$

$$f_1 = 30 \times 0.4$$

$$f_1 = 12 \text{ cm}$$

$$\frac{1}{f_2} = -\frac{0.6}{12}$$

$$f_2 = \frac{12}{-0.6}$$

$$f_2 = -20 \text{ cm}$$