CVO

4.6 A reduced eye ($n' = 1.336$) has a corneal radius of 5.75 mm and an axial length of 21.6 mm. What lens placed 15 mm from the principal point of this eye will render it emmetropic?

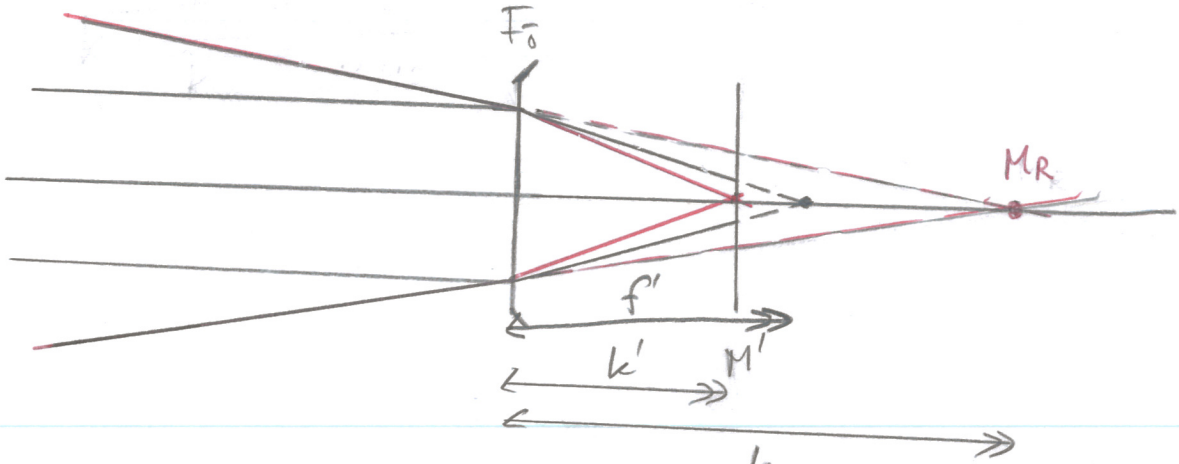
Lösning

$$F_0' = \frac{n' - n}{r} = \frac{1.336 - 1.0}{5.75 \cdot 10^{-3}}\ \mathrm{D} \approx 58.43\ \mathrm{D}$$

$$k' = 21.6\ \mathrm{mm} = 0.0216\ \mathrm{m}$$

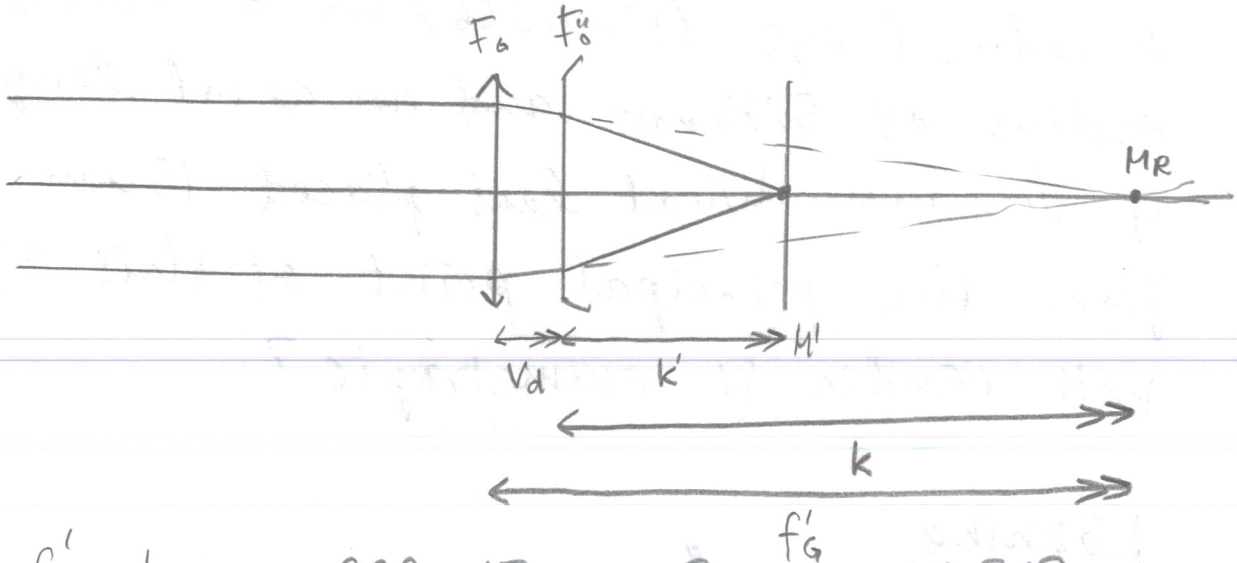
$$K' = \frac{n'}{k'} = \frac{1.336}{0.0216}\ \mathrm{D} \approx 61.85\ \mathrm{D}$$

$$K = K' - F_0' = 61.85 - 58.43 \approx 3.42\ \mathrm{D} \quad (K > 0 \text{ hyperopi})$$



Med korrektion vill vi att mellanbild hamnar i ögats fjärrpunkt, M_R.

$$k = \frac{1}{K} = \frac{1}{3.42}\ \mathrm{m} \approx 0.292\ \mathrm{m} = 292\ \mathrm{mm}$$



$$f'_G = k + V_d = 292 + 15\,mm = 307\,mm = 0{,}307\,m$$

$$F_G = \frac{1}{f'_G} = \frac{1}{0{,}307}\,D = \underline{\underline{+3{,}25\,D}}$$

Alt. lösning enl. ekv. (4.10)

$$F_G = \frac{K}{1 + V_d \cdot K} = \frac{3{,}42}{1 + 0{,}015 \cdot 3{,}42}\,D \approx \underline{\underline{+3{,}25\,D}}$$

CVO

4.5

Calculate the ocular refraction corresponding to a spectacle refraction of:

b) -8.00 DS.

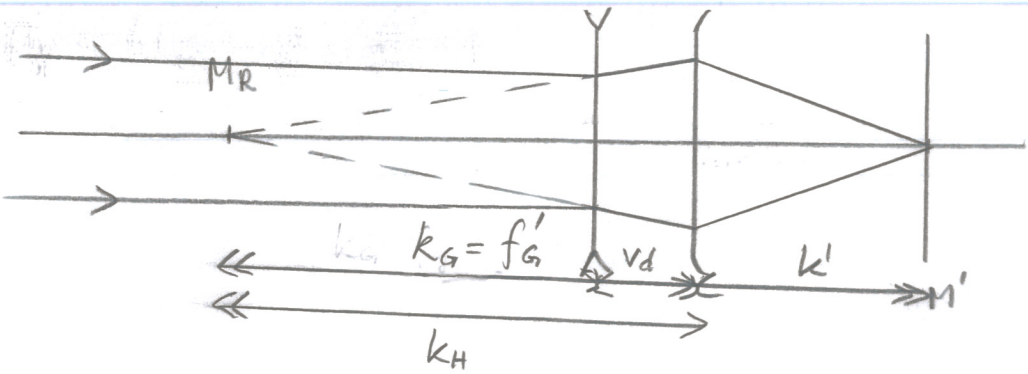
Assume the spectacle point to be 14 mm from the eye's principal point.

Lösning

$K_G = -8.00$ DS ← spherical surface

$v_d = 14$ mm $= 0.014$ m

Söks: K_H (hurvudpunktsrefraktion



$$k_H = f_g' - v_d = \frac{1}{-8.00} - 0.014\ m = -0.139\ m$$

$$K_H = \frac{1}{k_H} = \frac{1}{-0.139}\ D \approx \underline{\underline{-7.2\ D}}$$

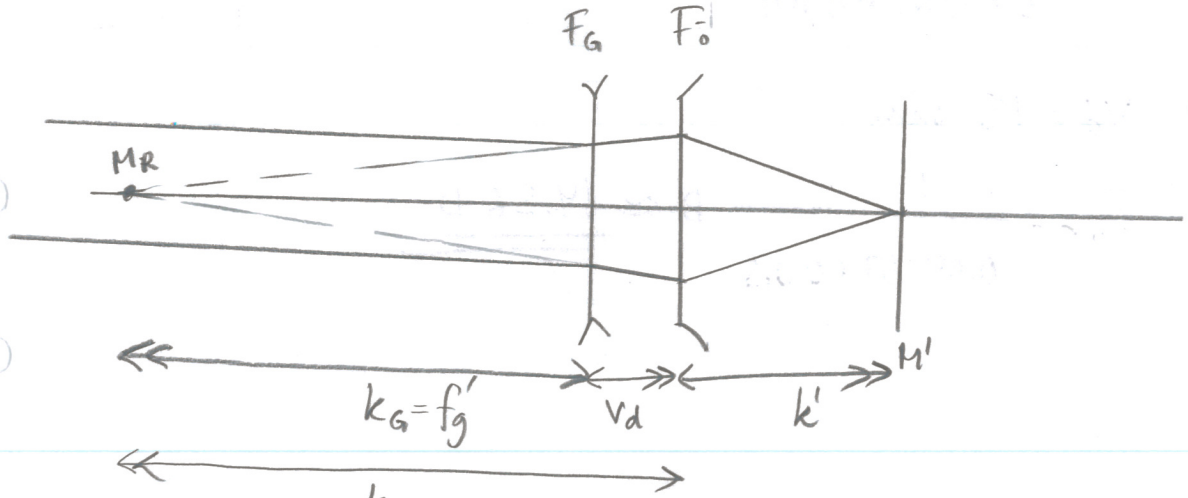
CVO

4.7

a) A myope is found to require -12.00 D, the spectacle point being 13 mm from the reduced surface. Determine the distance correction required if this vertex distance were altered to (i) 11 mm, (ii) 15 mm.

b) Repeat a) for an original correction of +15.00 D, all other values being unchanged.

Lösning



$F_G = -12.00\ D \Rightarrow f_g' = \frac{1}{-12.00}\ m \approx -0.08333\ m = -83.33\ mm$

$V_d = 13\ mm$

Oavsett glasögon och V_d så vill man att mellanbilden alltid hamnar i ögats fjärrpunkt.

$k_H = f_g' - V_d = \frac{1}{-12.00} - 0.013\ m = -0.09633\ m = -96.33\ mm.$ (konst.)

$f_g' = k_H + V_d$

(i) $V_d = 11\ mm$

$\Rightarrow f'_{g_{11}} = -96.33 + 11\ mm = -85.33\ mm = -0.08533\ m$

$F_{g_{11}} = \frac{1}{-0.08533}\ D \approx \underline{\underline{-11.72\ D}}$

(ii) $V_d = 15\ mm$

$F_{g_{15}} = \frac{1}{-0.09633 + 0.015}\ D \approx \underline{\underline{-12.30\ D}}$

b) $f'_g = \frac{1}{15.00}\ m = 0.06667\ m = 66.67\ mm$

$k_H = f'_g - V_d = 66.67 - 13\ mm = 53.67\ mm$

$f'_g = k_H + V_d$

(i) $V_d = 11\ mm$

$F_{G_{11}} = \frac{1}{0.05367 + 0.011}\ D \approx \underline{\underline{15.46\ D}}$

(ii) $V_d = 15\ mm$

$F_{G_{15}} = \frac{1}{0.05367 + 0.015}\ D \approx \underline{\underline{14.56\ D}}$

CVO

7.1 Find the distance of the near point and the range of the accommodation in each of the following cases, assumed to uncorrected:

a) Emmetropia: Amp = 7,50 D

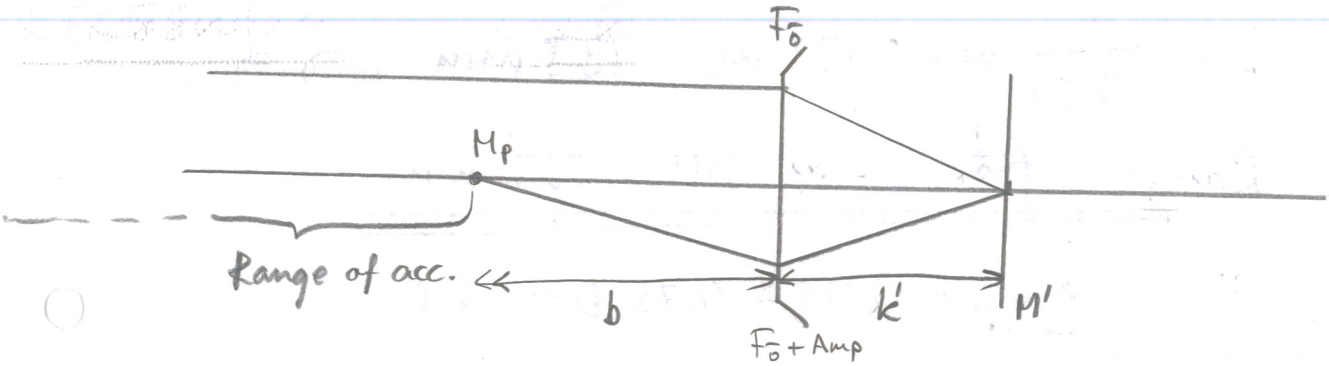
b) Hypermetropia: +2.75 D: Amp = 4.75 D

c) — " — +3.25 D: Amp = 2.25 D

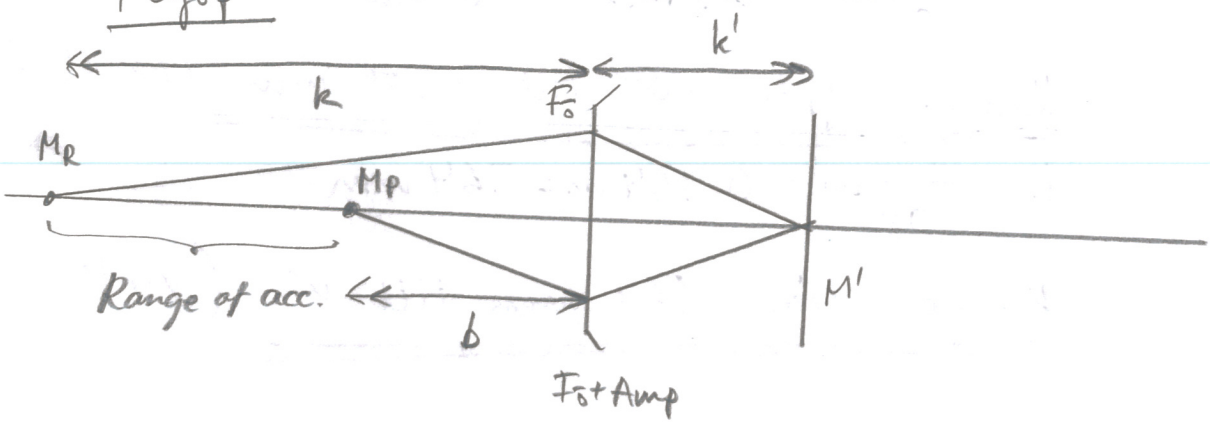
d) Myopia: -12.00 D: Amp = 4.00 D

Lösning

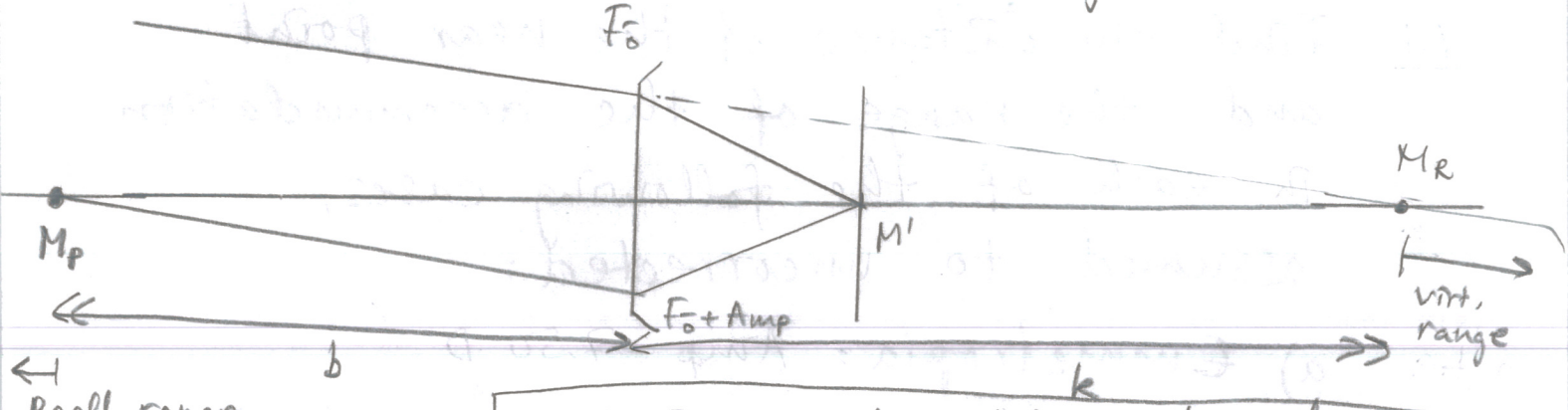
Emmetrop



Myop



Hyperopi: { Alltid virtuell range
Ibland även reell range



OBS! Inte alltid ögat kan ackommodera så mycket att man kan se avlägsna obj. ($-\infty$)
⇒ Bara virt. range i sånt fall

I alla fall finner vi närpunktens position från b.

Ekv. 7.4:

$B = K - Amp$

a) $B = K - Amp = \frac{1}{-\infty} = 7.50\,D = 0 - 7.50\,D = -7.50\,D$

$b = \frac{1}{-7.50} \approx -0.133\,m = -133\,mm$

Range från $-\infty$ till -133 mm

b) $B = K - Amp = 2.75 - 4.75\,D = -2\,D$

$b = \frac{1}{-2}\,m = -0.5\,m = -500\,mm$

Range från $-\infty$ till -500 mm (reell del)

$k = \frac{1}{2.75}\,m = 0.364\,m = 364\,mm$

Range från 364 mm till ∞ (virtuell del)

c) $B = K - Amp = 3.25 - 2.25 = 1.00\ D$

$b = \frac{1}{1.00} m = 1.00\ m$ (bakom ögat)

$k = \frac{1}{3.25} m = 0,308\ m = 308\ mm$

Range från 308 mm till 1000 mm (virtuell endast)

d) $B = K - Amp = -12.00 - 4.00\ D = -16.00\ D$

$b = -0.0625\ m = -62.5\ mm$

$k = \frac{1}{-12.00} m = -0,0833\ m = -83.3\ mm$

Range från −83.3 mm till −62.5 mm