785.

Problem 52.32 (RHK)

The mirrors in a laser form a cavity in which standing waves of laser light are set up. In the vicinity of 533 nm, *we have to find the difference in wavelengths of the allowed adjacent operating modes. The mirrors are* 8.3 cm *apart.*

Solution:

Let $\Delta\lambda$ be the difference in wavelengths of the allowed adjacent operating modes. The condition of linear stationary modes is that between the two mirrors the adjacent modes will have one additional node. That is

$$\frac{2\pi L}{\lambda-\Delta\lambda}-\frac{2\pi L}{\lambda}=\pi,$$

or

$$\frac{2L}{\lambda-\Delta\lambda}-\frac{2L}{\lambda}=1\,.$$

The distance between the two mirrors $L=8.3\times10^{-2}$ m, and $\lambda=533\times10^{-9}$ m.

We have

$$2L \times \frac{\Delta\lambda}{\lambda^2}\ ;\ 1,$$

$$\therefore\ \Delta\lambda = \frac{\left(533\times10^{-9}\right)^2}{2\times8.3\times10^{-2}}\ \text{m} = 1.7\ \text{pm}.$$