

97. The rotational inertia of a uniform rod with pivot point at its end is  $I = mL^2/12 + mL^2 = \frac{1}{3}ML^2$ . Therefore, Eq. 16-29 leads to

$$T_0 = 2\pi\sqrt{\frac{\frac{1}{3}ML^2}{Mg(L/2)}} = 2\pi\sqrt{\frac{2L}{3g}} .$$

If we replace  $L$  with  $L/2$  (for the case where half has been cut off) then the new period is  $T = 2\pi\sqrt{L/3g}$ . Since frequency is the reciprocal of the period, then  $T_0/T = f/f_0$  which leads to

$$\frac{f}{f_0} = \frac{2\pi\sqrt{2L/3g}}{2\pi\sqrt{L/3g}} \implies f = f_0\sqrt{2} .$$