10/22/13
R.P. Woodard

Solution to Problem 11.D

* $q = q \Rightarrow P_{rad} \cong \frac{\mu_0 e^2 g^2}{6\pi c}$

* $h(t) \cong -\frac{1}{2} g t^2 \Rightarrow \Delta t = \sqrt{\frac{2\Delta h}{g}}$

$\Rightarrow W_{rad} \cong P_{rad} \cdot \Delta t \cong \frac{\mu_0 e^2 g^2}{6\pi c} * \sqrt{\frac{2\Delta h}{g}}$

* $\Delta U_{grav} = mg \Delta h$

$$\therefore \frac{W_{rad}}{\Delta U_{grav}} = \frac{\mu_0 e^2 g^2}{6\pi c} \sqrt{\frac{2\Delta h}{g}} * \frac{1}{mg\Delta h} = \frac{\mu_0 e^2}{6\pi mc} \sqrt{\frac{2g}{\Delta h}}$$

$$= \frac{\left(4\pi \cdot 10^{-7} \frac{kg\cdot m}{C^2}\right)(1.6\times10^{-19} C)^2}{6\pi (9.1\times10^{-31} kg)(3\times10^{+8} \frac{m}{s})} \sqrt{\frac{2 \cdot 9.8 \frac{m}{s^2}}{\frac{1}{100} m}} \cong \boxed{2.8 \times 10^{-22}}$$

* NB this means that radiation reaction is negligible