Ch. 14 Prob. 62

$C = 5000\,pF = 5.0\times10^{-9}\,F$

$V = 100\,V$

$L = 80\,mH = 8.0\times10^{-2}\,H$

a) Find the max energy (magnetic) in the inductor.

Since all of the energy is in the capacitor

$$U_e = \frac{1}{2}CV^2 = \frac{(5.0\times10^{-9}\,F)(100\,V)^2}{2} = 2.5\times10^{-5}\,J$$

with no resistance, eventually all of this energy becomes magnetic energy in the inductor once the capacitor completely discharges,

$\therefore$ $\boxed{U_m = 2.5\times10^{-5}\,J}$

b) Find the peak value of current.

Since the energy is all inside the inductor and $U_m = \frac{1}{2}LI^2$, then $I = \sqrt{\frac{2U_m}{L}}$

$$I = \sqrt{\frac{2(2.5\times10^{-5}\,J)}{8.0\times10^{-2}\,H}} = \boxed{0.025\,A}$$

c) Find the frequency of the oscillation

angular frequency of this circuit is

$$\omega = \frac{1}{\sqrt{L\cdot C}} = \frac{1}{\sqrt{(8.0\times10^{-2}\,H)(5.0\times10^{-9}\,F)}} = 5.0\times10^{4}\,\frac{rad}{s}$$

Convert to Hertz gives

$$f = \frac{\omega}{2\pi} = \frac{5.0\times10^{4}\,\frac{rad}{s}}{2\pi} = \boxed{7{,}960\,Hz}$$