Flipping Physics Lecture Notes:
Energy Stored in a Capacitor
http://www.flippingphysics.com/capacitor-energy.html

To derive the equation for the energy stored in a capacitor, start with an uncharged capacitor, move one, infinitesimally small charge from one plate to the other plate. Because the electric potential difference between the plates is zero, moving this first charge takes no work. However, moving the next charge does take work because there is now an electric potential difference between the two plates. The work it takes to move a charge equals the change in electric potential energy of the capacitor and it equals the magnitude of the charge which is moved times the electric potential difference the charge is moved through which is the electric potential difference across the capacitor which now has an infinitesimally small electric potential difference across it. We need to identify the infinitesimally small charge as dq and the amount of work it takes to move that charge dW. And take the integral of both sides.

$$Q_i = 0 \ \ \& \ \ W = \Delta U_{\text{elec}} = q\Delta V \Rightarrow \mathrm{d}W = \Delta V \mathrm{d}q$$

$$\& \ \ C = \frac{Q}{\Delta V} \Rightarrow \Delta V = \frac{Q}{C} \Rightarrow Q = C\Delta V$$

$$W = \int_0^Q \Delta V \,\mathrm{d}q = \int_0^Q \frac{q}{C}\mathrm{d}q = \left[\frac{q^2}{2C}\right]_0^Q = \frac{Q^2}{2C} - \frac{0^2}{2C} \Rightarrow U_C = \frac{Q^2}{2C}$$

$$\Rightarrow U_C = \frac{(C\Delta V)^2}{2C} = \frac{1}{2}C\Delta V^2 = \frac{1}{2}\left(\frac{Q}{\Delta V}\right)\Delta V^2 = \frac{1}{2}Q\Delta V$$

$$\Rightarrow U_C = \frac{Q^2}{2C} = \frac{1}{2}C\Delta V^2 = \frac{1}{2}Q\Delta V$$

Note: The energy stored in the capacitor is stored in the electric field of the capacitor and is equal to the amount of work needed to move the charges from one plate to the other.

The capacitor in the disposable camera:

$$C = 120\mu F; \ \Delta V = 330V$$

$$\Rightarrow U_C = \frac{1}{2}C\Delta V^2 = \frac{1}{2}\left(120 \times 10^{-6}\right)(330)^2 = 6.532 \approx 6.5J$$

$$\Rightarrow U_C = 6.532J \times \left(\frac{1\,eV}{1.6x10^{-19}J}\right) = 4.0825 \times 10^{19} \approx 41 \times 10^{18} eV$$

$$\Rightarrow U_C \approx 41 \times 10^9 \times 10^9 eV \Rightarrow U_C \approx 41 \text{ billion billion } eV$$