1a) $\frac{\# f}{sec} = 2500.\times10^6\ W \times \frac{1\ J/s}{1\ W} \times \frac{1}{195.\times10^6\ \frac{eV}{fission} \times 1.602\times10^{-19}\ J/eV}$

$= 8.00\times10^{19}\ f/s$

1b) $A = 2.2\times10^4 \times 10^{-12}\ Ci \times 3.7\times10^{10}\ /s/Ci = 814\ /s$ in one liter

production $A = N\sigma\phi(1-e^{-\lambda t})$ but λt is small so

$$A \simeq N\sigma\phi(\lambda t)$$

$t \simeq \frac{A}{N\sigma\phi\lambda}$

$N = 1\ l \times \frac{1\ kg}{1\ l} \times \frac{6.022\times10^{23}\ /mol}{0.018\ kg/mol\ H_2O} \times \frac{2H}{1H_2O} \times 1.15\times10^{-4}\ \frac{D}{H}$

$\sigma = 0.53\ mb \times 1\times10^{-27}\ cm^2/mb$

$\lambda = \frac{\ln 2}{12.3\ yr \times 3.15\times10^7\ s/yr} = 1.78\times10^{-9}/s$

$t \simeq \frac{814\ /s}{7.69\times10^{+21} \times 5.3\times10^{-28}\ cm^2 \times 10^{13}\ /cm^2/s \times 1.78\times10^{-9}/s} = \frac{814/s}{0.07259\ (/s)^2}$

$t \simeq 1.12\times10^4\ s = 186\ min = 3.11\ hr$

1c) $A(10\ days) = N\sigma\phi\lambda t = 0.07259\ (/s)^2 \times 10\ d \times 24\ \frac{hr}{d} \times 3600\ \frac{s}{hr}$

$A(10\ days) = 62{,}718\ /s$

dilution factor $= \frac{OBS\ A}{calc\ A} = \frac{814\ /s}{62718\ /s} = 1.3\times10^{-2}$

Note this dilution factor does not seem very large - the water was probably in the reactor for a longer period and had a higher initial activity