1) a) $\frac{a(t)}{a_0} = \frac{1}{10^6}$ $\quad n_e(0) \sim .2\,m^{-3} = 2\times10^{-1}\,m^{-3}$

$n = \frac{N}{V}$, $V \propto a(t)^3 \Rightarrow n(t) \propto \frac{1}{a(t)^3}$

$\frac{n(t)}{n_0} = \left(\frac{a_0}{a(t)}\right)^3 = (10^6)^3 = 10^{18}$

$n(t) = 10^{18} n_0 = 10^{18} \times 2\times10^{-1} = \boxed{2\times10^{17}\,m^{-3}}$

b) Relativistic?

$T \propto \frac{1}{a(t)}$

$\frac{T(t)}{T_0} = \frac{a_0}{a(t)} \rightarrow T(t) = 10^6 T_0 \sim \boxed{3\cdot10^6\,K}$

$KE$ (in eq.) $= kT = 2.3\times10^2\,eV = 2.3\times10^{-4}\,MeV$

$\boxed{KE \ll mc^2 \Rightarrow NR}$

c) $\sigma_T = 6.7\times10^{-29}\,m^2$

$\lambda_{MFP} \frac{1}{n\sigma} = \boxed{7.5\times10^{10}\,m}$

d) $t = d/v = \boxed{248\,s}$

comment: $\sim 1.3\times10^9$ cell

of assumptions