4 SN 1987 A

$$E = \frac{m}{\sqrt{1-v^2}} \Rightarrow v = \sqrt{1-(m/E)^2} \approx 1 - \frac{1}{2}\left(\frac{m}{E}\right)^2$$

$$\frac{1}{v} = 1 + \frac{1}{2}\left(\frac{m}{E}\right)^2$$

travel time $t = L/v$, difference

$$\Delta t = t_2 - t_1 = L\left(\frac{1}{v_2} - \frac{1}{v_1}\right) = L\left[\frac{1}{2}\left(\frac{m_2}{E_2}\right)^2 - \frac{1}{2}\left(\frac{m_1}{E_1}\right)^2\right]$$

to simplify: $m_1 = m_2$

$$\Delta t = \frac{L m^2}{2}\left(\frac{1}{E_2^2} - \frac{1}{E_1^2}\right)$$

$$\Rightarrow m = E_1 E_2 \sqrt{\frac{2\Delta t}{L(E_1 - E_2)|E_1 + E_2|}} \approx 50\ eV$$

5| $P_{a \to a'} = \sin^2 2\vartheta \; \sin^2\left(\frac{E_2 - E_1}{2} t\right)$

$E_2 - E_1 \approx m_2 - m_1$

$\Rightarrow$ oscillaci perioda $T = \frac{2\pi}{E_2 - E_1} \approx \frac{2\pi}{m_2 - m_1} \approx 10^{-9}\,s$

$\uparrow 3.5 \cdot 10^{-12}\,MeV$

b) lišta $\tau(K_S^0) \sim 9 \cdot 10^{-11}\,s \ll T$

$\tau(K_L^0) \sim 5 \cdot 10^{-8}\,s \gg T$

oscilace "zapadlo" K_S^0.