

9. Table 45-4 gives the rest energy of each pion as 139.6 MeV. The magnitude of the momentum of each pion is  $p_\pi = (358.3 \text{ MeV})/c$ . We use the relativistic relationship between energy and momentum (Eq. 38-52) to find the total energy of each pion:

$$E_\pi = \sqrt{(p_\pi c)^2 + (m_\pi c^2)^2} = \sqrt{(358.3 \text{ MeV})^2 + (139.6 \text{ MeV})^2} = 384.5 \text{ MeV} .$$

Conservation of energy yields  $m_\rho c^2 = 2E_\pi = 2(384.5 \text{ MeV}) = 769 \text{ MeV}$ .