59. (a) Since the positron has the same mass as an electron, and the neutrino has negligible mass, then

$$\Delta m\, c^2 = (\mathbf{m}_\mathrm{B} + m_e - \mathbf{m}_\mathrm{C})\, c^2 \ .$$

Now, since Carbon has 6 electrons (see Appendix F and/or G) and Boron has 5 electrons, we can add and subtract $6m_e$ to the above expression and obtain

$$\Delta m\, c^2 = (\mathbf{m}_\mathrm{B} + 7m_e - \mathbf{m}_\mathrm{C} - 6m_e)\, c^2 = (m_\mathrm{B} + 2m_e - m_\mathrm{C}\,)\, c^2 \ .$$

We note that our final expression for Δmc^2 involves the *atomic* masses, as well an "extra" term corresponding to two electron masses. From Eq. 38-47 and Table 38-3, we obtain

$$Q = (m_\mathrm{C} - m_\mathrm{B} - 2m_e)\, c^2 = (m_\mathrm{C} - m_\mathrm{B})\, c^2 - 2(0.511\,\mathrm{MeV}) \ .$$

(b) The disintegration energy for the positron decay of Carbon-11 is

$$Q = (11.011434\,\mathrm{u} - 11.009305\,\mathrm{u})\,(931.5\,\mathrm{MeV/u}) - 1.022\,\mathrm{MeV} = 0.961\ \mathrm{MeV} \ .$$