In-class problem linked to lecture pages 204-218

About 0.4 eV is required to dissociate a molecule of liquid water into H^+ and OH^- ions. The dissociated molecule has twice as many states accessible to it as does the non-dissociated molecule. What fraction of water molecules are dissociated in a glass of water at room temperature?

In-class 204.-218

$$\frac{P_e}{P_g} = \left(\frac{n_e}{n_g}\right) e^{-\beta(E_e - E_g)}$$

Let $E_e - E_g = 0.4\ eV$

Let $\frac{n_e}{n_g} = 2$

Let $T = 300K$, so

$$\beta = \frac{1}{kT} = \frac{1}{(8.63 \times 10^{-5})(300)}$$

Then $\frac{P_e}{P_g} = 2 \cdot e^{-(0.4)/(8.63 \times 10^{-5})(300)}$

$$= \boxed{3.9 \times 10^{-7}}$$