Chapter 34 Problem 57 [†]

Given
$E = 9.32\ \mu eV$
$n = 225$

Solution
Find the original state of the atom.

The energy of a Rydberg atom is given by the formula

$$E_n = \frac{-13.6\ eV}{n^2} \tag{1}$$

The final energy of the atom is then

$$E_{225} = \frac{-13.6\ eV}{225^2} = -2.686 \times 10^{-4}\ eV$$

$$E_{225} = -268.6\ \mu eV$$

The energy lost to get to this state was $9.32\ \mu eV$. Therefore, the initial energy was

$$E_i = -268.6\ \mu eV + 9.32\ \mu eV = -259.28\ \mu eV$$

Taking equation (1) and solving for n gives

$$n = \sqrt{\frac{-13.6\ eV}{E_n}}$$

The initial state of the Rydberg atom was then

$$n = \sqrt{\frac{-13.6\ eV}{2.5928 \times 10^{-4}\ eV}} = 229$$

[†]Problem from Essential University Physics, Wolfson