Chapter 36 Problem 19 [†]

Solution

Find the orbital quantum number of an electron that has an orbital angular momentum of $L = \sqrt{30}\hbar$.

Since orbital angular momentum is given by the equation

$$L = \sqrt{l(l+1)}\hbar$$

Then

$$L = \sqrt{30}\hbar = \sqrt{l(l+1)}\hbar$$

$$30 = l(l+1)$$

$$l^2 + l - 30 = 0$$

$$(l-5)(l+6) = 0$$

Therefore,

$$l = 5, -6$$

Since l can not be negative, then

$$l = 5$$

[†]Problem from Essential University Physics, Wolfson