## 735.

## Problem 50.27 (RHK)

We have to find the uncertainty in the location of a particle, in terms of its de Broglie wavelength $\lambda$, so that the uncertainty in its velocity is equal to its velocity.

## Solution:

Let the mass of the particle be $m$ and its velocity be $v$. It is given that the uncertainty in the velocity is equal to the velocity. Therefore, the uncertainty in the momentum of the particle will be
$\Delta p=m \Delta v=m v$.
From the Heisenberg's uncertainty principle we expect that the uncertainty in the position of the particle will be of the order of

$$
\Delta x=\frac{h}{2 \pi \Delta p}=\frac{h}{2 \pi \times(m v)}=\frac{\lambda}{2 \pi},
$$

where we have used that the de Broglie wavelength
$\lambda=\frac{h}{p}=\frac{h}{m v}$.

