Chapter 7   Problem 56 [†]

Given
$r = 11\ cm = 0.11\ m$
$l_s = 1.5\ cm = 0.015\ m$
$\mu = 0.61$

Solution
Find the number of times the bug slides across the sticky region.

Each time the bug crosses the sticky region friction does work to remove energy from the system. Each time the bug crosses the patch the work done by friction is

$$W_f = F_f l_s = \mu N l_s = \mu m g l_s$$

The force of friction is the coefficient of friction times the normal force, which in turn is equal and opposite to the gravitational force.
The energy the bug starts with is purely potential energy. The height at which the bug starts is equal to the radius of the hemisphere. Therefore, the potential energy is

$$U = mg\Delta h = mgr$$

The number of times W_f goes into U gives an indication of how many times the bug will cross the sticky portion.

$$\#crossings = \frac{U}{W} = \frac{mgr}{\mu mgl_s} = \frac{r}{\mu l_s} = \frac{(0.11\ m)}{(0.61)(0.015\ m)}$$

$$\#crossings = 12.02$$

The bug crosses 12 full times and gets stuck almost immediately after it hits the sticky portion the 13th times.