Problem 7.2

A raindrop, assumed to be a point mass, falls 100. meters.

a.) How much work does gravity do on the droplet as it falls?

Noting that the gravitational force will equal "mg," and that because the direction of gravity and the direction of the displacement is the same (both are downward), the angle between the two vectors is zero. Using the definition approach for work calculations yields:

$$\begin{aligned} W_F &= \left|\vec{F}\right|\left|\vec{d}\right|\cos\phi \\ &= mgd\cos 0^\circ \\ &= \left[\left(3.35\text{x}10^{-5}\ \text{kg}\right)\left(9.80\ \text{m/s}^2\right)\right]\left(1.00\text{x}10^{2}\ \text{m}\right)(1) \\ &= 3.2810^{-2}\ \text{J} \end{aligned}$$

b.) How much work does friction do on the droplet as it falls?

For the droplet to fall at CONSTANT, "terminal velocity," no net work can be done (otherwise, the velocity would change). That means the energy put into the system by the 3.2810^{-2} joules of positive work done by gravity must be removed by friction doing 3.2810^{-2} joules of *negative* work on the droplets.