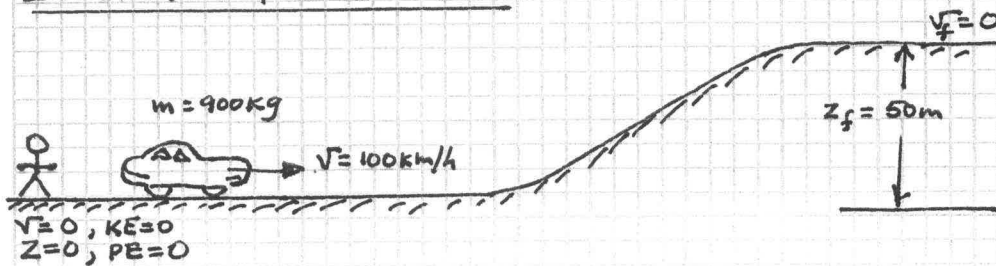


PROBLEM 2.8

KNOWN: Data are provided for an automobile on the open road.

FIND: Determine the changes in kinetic energy and gravitational potential energy for the automobile, in kJ

SCHEMATIC & GIVEN DATA:



ENGINEERING MODEL:

1. As shown in the schematic, the automobile is the system.
2. The acceleration of gravity is constant, $g = 9.81 \text{ m/s}^2$.
3. The datums for KE and PE are embedded in the road surface, where indicated by the stationary observer.

ANALYSIS:

The change in kinetic energy is

$$\Delta KE = \left(0 - \frac{1}{2} m V^2 \right) = -\frac{1}{2} (900 \text{ kg}) \left(\frac{100 \text{ km}}{\text{h}} \right)^2 \left| \frac{10^3 \text{ m}}{1 \text{ km}} \right|^2 \left| \frac{1 \text{ h}}{3600 \text{ s}} \right|^2 \left| \frac{1 \text{ N}}{1 \text{ kg} \cdot \text{m/s}^2} \right| \left| \frac{1 \text{ kJ}}{10^3 \text{ N} \cdot \text{m}} \right|$$
$$= -347.2 \text{ kJ} \quad \leftarrow$$

The change in potential energy is

$$\Delta PE = [m g Z_f - 0] = (900 \text{ kg}) (9.81 \frac{\text{m}}{\text{s}^2}) (50 \text{ m}) \left| \frac{1 \text{ N}}{1 \text{ kg} \cdot \text{m/s}^2} \right| \left| \frac{1 \text{ kJ}}{10^3 \text{ N} \cdot \text{m}} \right|$$
$$= +441.5 \text{ kJ} \quad \leftarrow$$