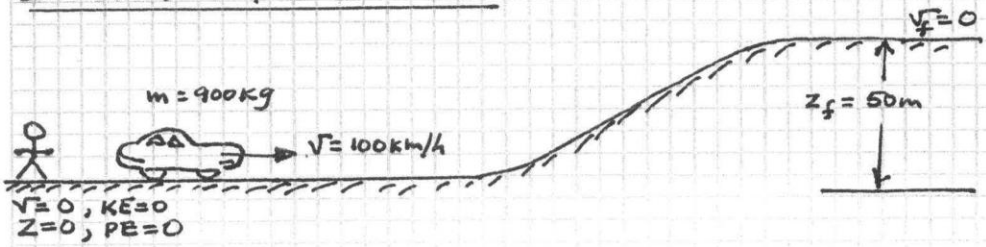
PROBLEM 2.8

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, $g = 9.81 m/s^2$.
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

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

$$= -347.2 kJ \longleftarrow$$

The change in potential energy is

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

$$= +441.5 kJ \longleftarrow$$