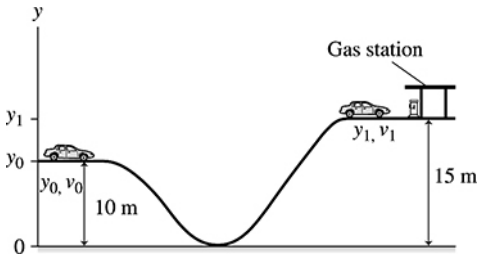
10.13. **Model:** Model the car as a particle with zero rolling friction. The sum of the kinetic and gravitational potential energy, therefore, does not change during the car's motion.

Visualize:



Solve: The initial energy of the car is

$$K_0 + U_{g0} = \frac{1}{2}mv_0^2 + mgy_0 = \frac{1}{2}(1500\text{ kg})(10.0\text{ m/s})^2 + (1500\text{ kg})(9.8\text{ m/s}^2)(10\text{ m}) = 2.22\times10^5\text{ J}$$

The car increases its height to 15 m at the gas station. The conservation of energy equation $K_0 + U_{g0} = K_1 + U_{g1}$ is

$$2.22\times10^5\text{ J} = \frac{1}{2}mv_1^2 + mgy_1 \Rightarrow 2.22\times10^5\text{ J} = \frac{1}{2}(1500\text{ kg})v_1^2 + (1500\text{ kg})(9.8\text{ m/s}^2)(15\text{ m})$$
$$\Rightarrow v_1 = 1.41\text{ m/s}$$

Assess: A lower speed at the gas station is reasonable because the car has decreased its kinetic energy and increased its potential energy compared to its starting values.