

**Question #76720, Physics / Mechanics | Relativity**

1. A 20-kg sled has gotten away. The sled starts from rest and goes down a straight down the hill. How fast will be the sled be at the bottom of the hill if it loses 100-m in altitude and friction is negligible?

**Solution**

From the conservation of energy:

$$\frac{mv^2}{2} = mgh$$
$$v = \sqrt{2gh} = \sqrt{2(9.8)(100)} = 44 \frac{m}{s}$$

**Answer: 44  $\frac{m}{s}$ .**

2. Suppose that the sled in the previous example is observed to be 30 m/s at the bottom of the hill. How much energy is converted to thermal energy by friction on the way down?

**Solution**

From the conservation of energy:

$$mgh = \frac{mv^2}{2} + Q$$
$$Q = m \left( gh - \frac{v^2}{2} \right) = 20 \left( (9.8)(100) - \frac{30^2}{2} \right) = 11000 J = 11 kJ.$$

**Answer: 11 kJ.**

Answer provided by <https://www.AssignmentExpert.com>