

ii)

GIVEN

* A body at rest

>> accelerated to $v = 200 \text{ m/s}$ along inclined surface $\theta = 45^\circ \left(\frac{\pi}{4}\right)$ relative to horizontal.>> travels $x = 10 \text{ m}$ >> work done $W = 200 \text{ kJ} = 2.00 \times 10^5 \text{ J}$ >> $g = 9.81 \text{ m/s}^2$ FIND

mass (kg) of body

EQUATIONPotential EN: $U = mgh$ Kinetic EN: $K = \frac{1}{2}mv^2$

conservation of EN

$$W = K + U$$

ASSUMPTION

no friction, and other energy losses

SOLN

$$(\text{height}) h = x \sin \theta = 10 \text{ m} \cdot \frac{\sqrt{2}}{2} = 5\sqrt{2} \text{ m}$$

$$W = mgh + \frac{1}{2}mv^2$$

$$m \left(gh + \frac{v^2}{2} \right) = W$$

$$m = \frac{W}{gh + \frac{v^2}{2}}$$

$$= \frac{2.00 \times 10^5 \text{ J}}{\left(\frac{9.81 \text{ m}}{\text{s}^2} \right) (5\sqrt{2} \text{ m}) + \left(\frac{200^2 \text{ m}^2}{2 \text{ s}^2} \right)} \approx 9.965 \text{ kg}$$

$$\approx \boxed{9.97 \text{ kg}}$$