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Mathematics 9709/42

Paper 4 Mechanics October/November 2023

Question No (1)

1 A block of mass 15 kg slides down a line of greatest slope of an inclined plane. The top of the plane is at a vertical height of 1.6 m above the level of the bottom of the plane. The speed of the block at the top of the plane is $2\,\mathrm{m\,s^{-1}}$ and the speed of the block at the bottom of the plane is $4\,\mathrm{m\,s^{-1}}$.

Find the work done against the resistance to motion of the block.

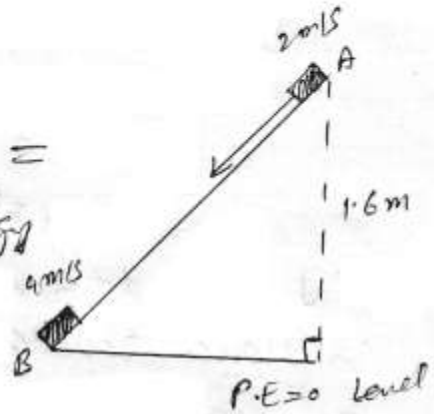
Solution:

Given data

Speed at A = 2 m s^{-1}

speed at B = 4 m/s

work done by net force = change in mechanical energy



w.D by driving force − w.D against resistance = $M.E_B - M.E_A$

w.D against resistance = w.D by driving force − $(M.E_B - M.E_A)$

$= 0 - [P.E_B + K.E_B] - (P.E_A + K.E_A)$

$= -\left(0 + \frac{1}{2}(15)(4)^2\right) + \left(mgh + \frac{1}{2}(15)(2)^2\right)$

$= -120 + (15)(10)(1.6) + \frac{1}{2} \times 15 \times 4$

$= -120 + 240 + 30$

$= 150$ J

w.D against resistance = 150 J