

STEP II, 2004, Q10

10 In this question take $g = 10\text{ms}^{-2}$.

The point A lies on a fixed rough plane inclined at 30° to the horizontal and ℓ is the line of greatest slope through A . A particle P is projected up ℓ from A with initial speed 6ms^{-1} . At time T seconds later, a particle Q is projected from A up ℓ , also with speed 6ms^{-1} . The coefficient of friction between each particle and the plane is $1/(5\sqrt{3})$ and the mass of each particle is 4kg .

- (i) Given that $T < 1 + \sqrt{3/2}$, show that the particles collide at a time $(3 - \sqrt{6})T + 1$ seconds after A is projected.
- (ii) In the case $T = 1 + \sqrt{2/3}$, determine the energy lost due to friction from the instant at which P is projected to the time of the collision.



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