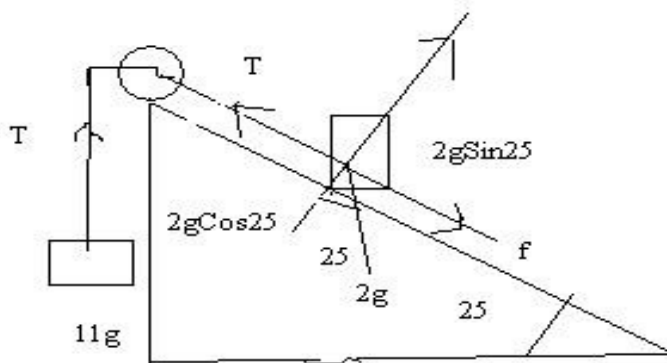


Q) A block of mass 2.0 kg is sliding up an inclined plane. The incline is 25° from the horizontal. The block is attached to a string hanging over a pulley with a mass of 11 kg attached to the other end. If the $\mu_k = 0.65$, what is the acceleration?

Solution



Referring to the cartoon above we need to consider motion along 2 directions

1. The vertical motion of 11Kg block with Tension T acting upward. The block moves downward with acceleration of a m/s^2

Since the net force on 11.0kg block will be downward, its equation of motion will be

$$11g - T = 11a \text{ ----Equation 1}$$

2. Motion of 2.0kg block sliding upward with an acceleration of a m/s^2 .The tension T acts in a direction opposite its weight ($2g \sin 25$).

Force of friction i.e. f between the sliding block and the inclined plane acts opposite to the direction of motion of this block as shown in the cartoon. Force of friction will be given by

$$f = \mu_k 2g \cos 25$$



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The equation of motion for the sliding block will be

$$T - 2g \sin 25^\circ - \mu 2g \cos 25^\circ = 2a \text{ ----Equation 2}$$

$$\mu = 0.65$$

Adding equation 1 and 2 we get

$$11g - 2g \sin 25^\circ - 0.65 * 2g \cos 25^\circ = 13a$$

$$g(11 - 2(\sin 25^\circ + 0.65 * \cos 25^\circ)) = 13a$$

Using value of g as 9.8 m/s^2 , We get

$$9.8(11 - 2(.42262 + 0.65 * .90631)) = 13a$$

$$9.8 * 8.97656 = 13a$$

$$a = 6.76695$$

Hence both the blocks move with the acceleration of 6.76695 m/s^2