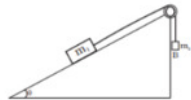


QUES 02

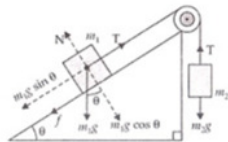
Mass m_1 moves on a slope making an angle θ with the horizontal and is attached to mass m_2 by a string passing over a frictionless pulley as shown in Fig. The coefficient of friction between m_1 and the sloping surface is μ . Which of the following statements are true?



- If $m_2 > m_1 \sin \theta$, the body will move up the plane.
- If $m_2 > m_1 (\sin \theta + \mu \cos \theta)$, the body will move up the plane.
- If $m_2 > m_1 (\sin \theta + \mu \cos \theta)$, the body will move up the plane.
- If $m_2 > m_1 (\sin \theta + \mu \cos \theta)$, the body will move down the plane.

Sol. Let's consider a case in which normal reaction i.e.

$N = m_1 g \cos \theta$ from figure also we know friction



$f = \mu N$ so $f = \mu m_1 g \cos \theta$ Now from figure taking whole as a system then

$m_2 g - (m_1 g \cos \theta + f) > 0$ when m_1 will up and m_2 will down.

Putting f in this equation

$$\Rightarrow m_2 g - (m_1 g \cos \theta + \mu m_1 g \cos \theta) > 0$$

$$\Rightarrow m_2 g > m_1 g \cos \theta + \mu m_1 g \cos \theta \text{ or in simply}$$

$$\Rightarrow m_2 > m_1 (\sin \theta + \mu \cos \theta) \text{ from this option (a) is totally wrong while option (b) is correct.}$$

Now if body m_1 moves down and m_2 moves up then, direction of friction force (f) becomes upward (opp. to motion)

Now if body m_1 moves down and m_2 moves up then, direction of friction force (f) becomes upward (opp. to motion)

$$\Rightarrow m_1 g \cos \theta - f > m_2 g$$

$$\Rightarrow m_1 g \cos \theta - \mu m_1 g \cos \theta > m_2 g$$

$$\Rightarrow m_1 (\sin \theta - \mu \cos \theta) > m_2$$

Hence option (d) is correct but option (c) is wrong.