5.12 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. 5.2. The co-efficient of friction between m_1 and the sloping surface is μ.

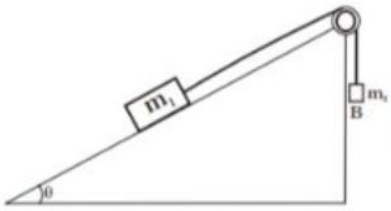


Fig. 5.2

Which of the following statements are true?

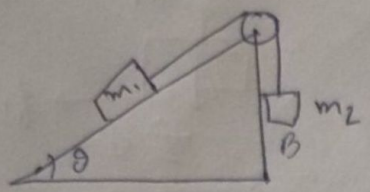
(a) If $m_2 > m_1 \sin\theta$, the body will move up the plane.

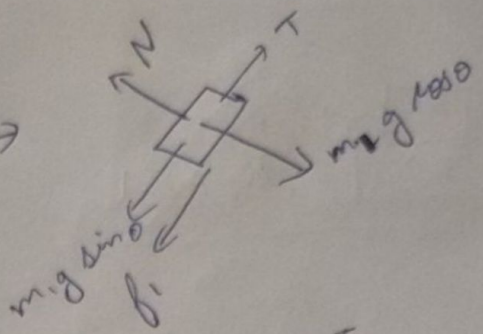
(b) If $m_2 > m_1(\sin\theta + \mu \cos\theta)$, the body will move up the plane.

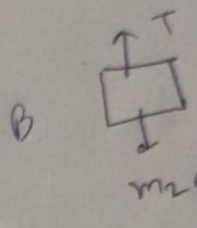
(c) If $m_2 < m_1(\sin\theta + \mu \cos\theta)$, the body will move up the plane.

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

$\Longrightarrow$







For body moving up the plane $\Rightarrow$

$$m_2 g > m_1 g \sin\theta + \mu m_1 g \cos\theta$$

$$m_2 > m_1 [\sin\theta + \mu \cos\theta]$$

For moving down the plane $\Rightarrow$

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

$$m_2 < m_1 [\sin\theta - \mu \cos\theta]$$

Ans. (b), (d)