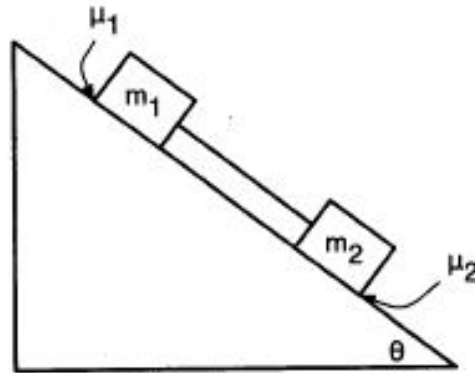


**QP48**

Two masses connected by a string slide down a ramp making an angle  $\theta$  with the horizontal, as shown in the figure below. The mass  $m_1$  has a coefficient of kinetic friction  $\mu_1$  and the mass  $m_2$  has a coefficient of kinetic friction  $\mu_2$ . Assume the string is massless and remains taut as the masses slide down the incline.



- (4 points) Draw the free body diagrams for both masses, showing the forces acting on each as they slide down the ramp. Write down the equations of Newton's Second Law for both  $m_1$  and  $m_2$ .
- (4 points) Find the acceleration  $a$  of the masses and the tension  $T$  of the string. Give your answer in terms of  $m_1$ ,  $m_2$ ,  $\mu_1$ ,  $\mu_2$ ,  $g$  and  $\theta$ .
- (2 points) Find the condition on  $\mu_1$  and  $\mu_2$  such that the string indeed remains taut as the masses slide down the incline.