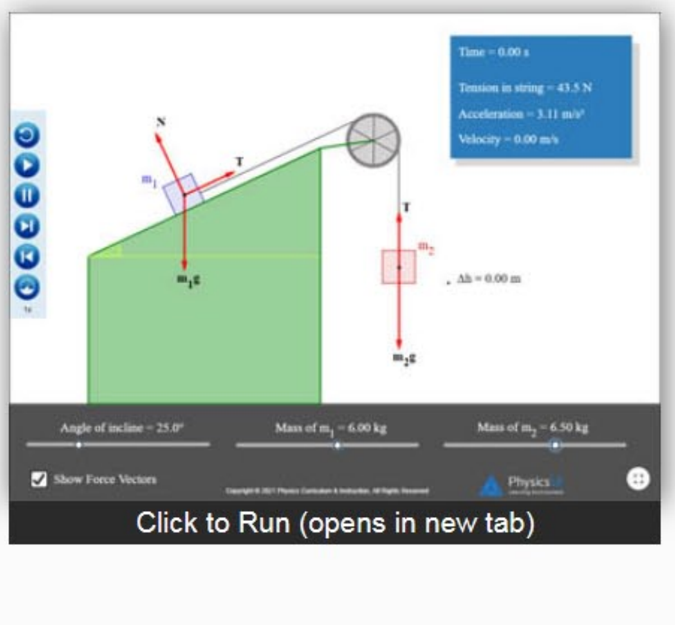
Newton's 2nd Law Lab: Incline with Masses and Pulley

Learning Goals

- Investigate tension and acceleration of a system composed of a mass on an incline connected to a hanging mass via a pulley.
- Examine how changing the angle of an incline changes the components of an object's weight.



Click to Run (opens in new tab)

Directions

Click on the image above to open the simulation required for the lab questions below. For this simulation the incline is frictionless and the pulley is massless. After the desired parameters are set press the play button to start the simulation, which will set the blocks in motion. It will be helpful to check *Show Force Vectors* when answering the lab questions. To precisely control the slider input, click on the slider button and use the left/right arrow keys.

Experimental Observation

Part 1: Tension and Acceleration

Set the *Angle of incline* = 0.00°, *Mass of* m_1 = 6.00 kg, *Mass of* m_2 = 4.00 kg

(1) Run the simulation and observe the motion of the two masses. How does the magnitude of their accelerations compare?

The acceleration of m_1 has a magnitude that is (No answer given) the acceleration of m_2.

(2) Gradually increase *Mass of* m_2 and observe the tension vectors.

As the weight of m_2 increases the magnitudes of the tension vectors (No answer given) .

(3) How does the magnitude of the tension acting on m_1 compare to the magnitude of the tension acting on m_2?

The magnitude of the tension acting on m_1 is (No answer given) the magnitude of the tension acting on m_2.

Part 2: Net Force

Set the *Angle of incline* = 0.00°, *Mass of* m_1 = 6.00 kg, *Mass of* m_2 = 6.50 kg

(4) Calculate the net force acting on m_1. (The positive direction is to the right.)

(5) Calculate the net force acting on m_2. (The positive direction is downward.)

(6) Given the two different net forces calculated above, why do m_1 and m_2 have the same acceleration?

They have the same acceleration because the different net forces are (No answer given) .

Part 3: Angle of Incline and Acceleration

Set the *Angle of incline* = 0.00°, *Mass of* m_1 = 6.00 kg, *Mass of* m_2 = 6.50 kg

(7) Gradually increase the *Angle of incline* from 0.00° to 60.0°. As the angle increases, what happens to the magnitude of the net force acting on m_1?

As the incline angle increases the net force (No answer given) .

(8) What causes the observed behavior in **(7)**?

As the incline angle increases the magnitude of the weight component of m_1 parallel to the incline (No answer given) . This parallel component of the weight acts in the direction that opposes motion.

Application

Set the *Angle of incline* = 0.00°, *Mass of* m_1 = 6.00 kg, *Mass of* m_2 = 6.50 kg

The weight of m_1 can be resolved into two different components, one in the direction parallel to the incline and one in the direction perpendicular to the incline.

The component of the weight of m_1 parallel to the incline is equal to the total weight times the (No answer given) of the incline angle above the horizontal.

What is the component of the weight of m_1 parallel to the incline when the *Angle of incline* is 0.00°?

What is the component of the weight of m_1 parallel to the incline when the *Angle of incline* is 60.0°?

Submit Answer