

Name: _____

PHYS 1110-02 Quiz 3

You may use an 8.5"×11" note sheet written on both sides, a calculator of any type, and a rose hip. Please write your answers in the boxes provided. Show your work outside the boxes. If you wish to change an answer written in a box, thoroughly erase the unwanted answer and write the desired answer in its place. If a numerical answer is a physical quantity rather than a pure number, include the units with your answer.

“Multiple choice” questions, in which only one answer is correct, have circular bubbles (○): select exactly one choice. “Select all” questions, in which any number of the choices may be correct, have square bubbles (□): select all correct answers. Select your choice by filling the circle or square: please do not “X”, check, circle, or otherwise mark your choice. Do not mark bubbles for rejected options.

If the point value of a question is not indicated, it is worth one point.

Constants and equivalents

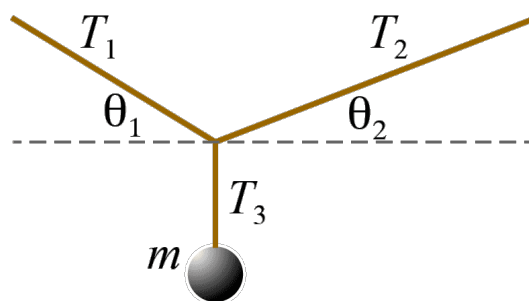
$g = 9.8 \text{ m/s}^2$	1 h = 60 min	1 min = 60 s	1 day = 24 h
1 in = 2.54 cm	1 ft = 12 in	1 m = 3.218 ft	1 mi = 5280 ft = 1609.3 m

Some metric prefixes

nano	n	$\times 10^{-9}$	deka	D	$\times 10^1$
micro	μ	$\times 10^{-6}$	hecta	h	$\times 10^2$
milli	m	$\times 10^{-3}$	kilo	k	$\times 10^3$
centi	c	$\times 10^{-2}$	mega	M	$\times 10^6$
deci	d	$\times 10^{-1}$	giga	G	$\times 10^9$

Questions

1. A ball of mass $m = 16.0 \text{ kg}$ hangs at rest from a vertical cable of negligible mass, which in turn hangs from two other cables, one at an angle of $\theta_1 = 50^\circ$ above vertical and the other at an angle of $\theta_2 = 40^\circ$ above vertical, as illustrated. Tell me the tensions in the three cables.

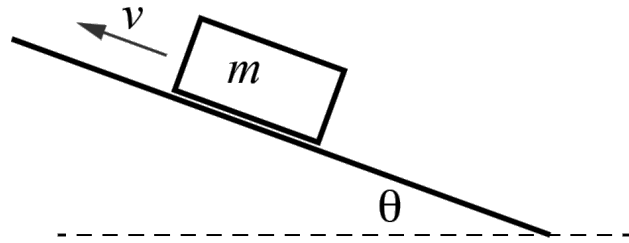


$T_1 =$

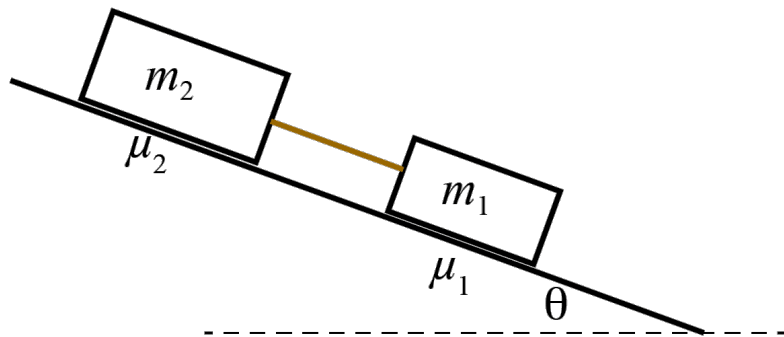
$T_2 =$

$T_3 =$

2. (4 points) A block of mass $m = 0.908$ kg coasts up a $\theta = 17^\circ$ incline. The coefficient of kinetic friction between the block and the surface of the incline is $\mu = 0.24$. What is the acceleration of the block?



3. (4 points) Two blocks on a $\theta = 22^\circ$ incline are connected by an inextensible string of negligible mass. The downhill block has a mass of $m_1 = 2.00$ kg, and the coefficient of kinetic friction between it and the surface of the incline is $\mu_1 = 0.20$. The uphill block has a mass of $m_2 = 3.00$ kg, and the coefficient of kinetic friction between it and the surface of the incline is $\mu_2 = 0.45$. At what rate do the blocks accelerate down the hill?



4. A pony on a lead trots in a circle of radius $r = 6.4$ meters at a constant speed of $v = 4.0$ meters per second.

A. (2 points) What is the path length of one trip around the circle?

B. (2 points) How long does it take the pony to complete one circuit?

C. (2 points) What is the magnitude of the pony's acceleration?

D. (2 points) What is the direction of the pony's acceleration?

5. Sisyphus pushes a 102-kg rock up a hill. After he pushes the rock for 200 meters, the rock slips from his grasp. At that point, the rock is 16.0 meters above the base of the hill. The force of rolling friction experienced by the rock along the path is 10.0 N.

A. How much work is done by gravity from the base of the hill to that point?

B. How much work is done by friction from the base of the hill to that point?

C. How much work is done by the normal force from the base of the hill to that point?

D. How much work is done by Sisyphus from the base of the hill to that point?

E. (4 points) The rock rolls back down the hill as Sisyphus watches. What is the kinetic energy of the rock when it arrives at the base of the hill?