General Physics
Physics 101
Test #2 – Spring 2011
Friday 3/4/11
Prof. Bob Ekey

Name (print):_____

I hereby declare upon my word of honor that
I have neither given nor received unauthorized
help on this work.

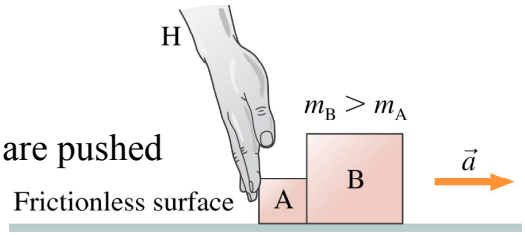
Signature:_____

Part I. Multiple Choice (3 pts each)

Instructions:

Please clearly circle one and only one answer for each of the following.
Show all of your work. Partial credit may be given if you include your work.

Questions:



1. Two blocks with masses m_A=5.00 kg and m_B = 10.0 kg are pushed on a frictionless surface with a force of 15.0 N as shown. Determine the force (mag & dir) of mass B on mass A.

(a) 15.0 N
(b) -10.0 N
(c) – 5.00 N
(d) +5.00 N

2. On a stationary bike, you pedal for 300 seconds and the wheel of the bike turns at a constant angular speed of 5.0 rad/s. During this time, how many revolutions did the bike wheel make?

(a) 1.5 x 10^3 rad
(b) 238.7 rad
(c) 2.4 x 10^3 rev
(d) 2.4 x 10^2 rev

3. You are attempting to move a 200 kg couch across a rug-covered floor. You find you must exert a horizontal force of 700 N to get the couch to barely move. What is the coefficient of static friction between the couch and the rug?

(a) μ_s = 0.357 N
(b) μ_s = 3.57
(c) μ_s = 0.29
(d) μ_s = 0.357

4. If you slam on the brakes of a car, all of the stuff on the dash continues forward and hits the windshield. Which of Newton's laws explains this phenomenon.

(a) Newton's First Law
(b) Newton's Second Law
(c) Newton's Third Law
(d) Newton's Fourth Law

5. A ball on the end of a 1.0 m long string spins from rest through an angle of 10 radians in 2.0 seconds. What is the angular acceleration of the ball?

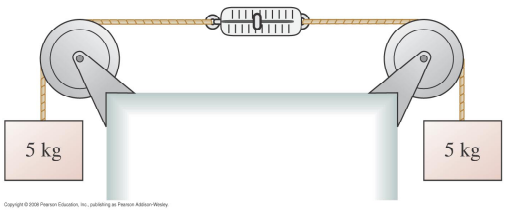
(a) 5.0 rad/s^2
(b) 10 rad/s^2
(c) 1.5 rad/s^2
(d) 20 rad/s^2

6. A cart sits motionless on a horizontal platform.
Which of these statements is false?

(a) the net force on the cart is zero.
(b) the normal force and force due to gravity are Newton III law pairs.
(c) the normal force and the force due to gravity are equal and opposite.
(d) the cart pushes on the ramp with an equal and opposite force to the ramp pushing on the cart.

7. The Moon revolves around the Earth in 27.3 days in a nearly circular orbit with a radius of 3.8 x 10^5 km. Assuming that the Moon's orbital motion is a uniform circular motion, what is the Moon's acceleration as it "falls" towards the Earth?

(a) 2.7 m/s^2
(b) 1.0 m/s^2
(c) 2.7 x 10^{-3} m/s^2
(d) 1.0 x 10^3 m/s^2



8. Two masses are at rest connected with a massless string over frictionless pulleys, as shown. What is the reading on the spring scale in Newtons?

(a) 5 kg
(b) 98 N
(c) 0
(d) 5×10^1 N

9. A wheel of radius 1.5 m rotates with a constantly increasing angular speed. What statement about a point on the rim of the wheel is false?

(a) It is experiencing no acceleration
(b) It is experiencing tangential acceleration
(c) It is experiencing angular acceleration
(d) It is experiencing centripetal acceleration

10. A constant force is applied to a mass, m, causing the object to accelerate at 2.0 m/s^2. If you double the mass, but halve the applied force, the new acceleration will be?

(a) 2.0 m/s^2.
(b) 4.0 m/s^2.
(c) 0.50 m/s^2.
(d) 0.25 m/s^2.

11. You are on an elevator standing on a scale. If the elevator is accelerating, which of the following readings on the scale are not possible.

(a) Greater than your weight
(b) Equal to your weight
(c) Less than your weight
(d) Zero

12 A wooden block of 2.0 kg slides up a wooden ramp angled at 20º above the horizontal. As the block slides back down the ramp, what is the magnitude of the net force acting on the block? Please include friction.

(a) 10 N
(b) 2.5 N
(c) 3.0 N
(d) 16 N

Part II. Short answer problems (12 pts each)

Instructions:

Solve three of the following four problems. If you try to solve all four problems, please clearly indicate which problems you wish to have graded. If you do not indicate this, I will assume you want me to grade problems one, two and three.

Please show all of your work, including equations without numbers.
Please provide units with all answers.
Partial credit may be given if you include your work.

Question 1. **Grade this problem? Yes or No (circle one)**

A circular Ferris wheel of diameter 60 m accelerates uniformly from rest to an angular speed of 2.0 rad/s and makes one complete revolution during this start-up.

(a) What is the angular acceleration of the Ferris wheel during the start-up?

(b) How long did it take for the Ferris wheel to start-up?

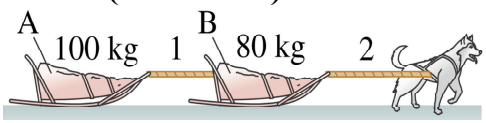
The Ferris Wheel is now rotating with a constant angular speed of 2.0 rad/s.

(c) Do all points on the Ferris wheel travel the same angular distance during one revolution? Explain.

(d) Calculate the magnitude and direction of the centripetal acceleration of an individual located on the edge of the Ferris Wheel.

Question 2. **Grade this problem? Yes or No (circle one)**

A sled dog drags sled A and B across the snow. The friction coefficient between the sleds and the snow is 0.10.



(a) Draw a force diagram showing all forces acting on sleds A and B. Be sure to use proper labels for each force. If not, please name each force appropriately.

(b) Calculate the magnitude of the friction force between sled A and the snow, and explicitly state in words its direction.

The magnitude of the force of friction between sled B and the snow can be found to be 78 N, and the tension in rope 1 is measured as 150 N. Using this knowledge and the information found/given…

(c) Determine the net acceleration of the system.

(d) Determine the tension in rope 2.

Question 3. **Grade this problem? Yes or No (circle one)**

In 1999, my girlfriend and I were driving back from dinner on an open road, and a deer jumped out in front of our car, and we hit the deer. I applied the brakes in a stern fashion to stop the car. We were traveling at about 15 m/s following the collision, and we traveled 10 m while stopping. Upon inspection my headlight was on fire, which I had to rip-off the car and hold like a torch. Good times.

(a) What is the acceleration of the car as it came to rest (magnitude and direction)?

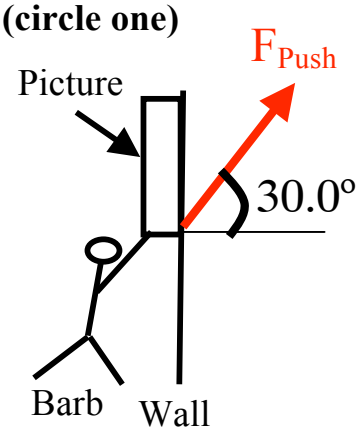
(b) What is the magnitude and direction of the force applied to the car (m=775 kg) as it came to rest?

(c) During the collision, which was greater the force of the deer on the car or the force of the car on the deer? Explain/Justify your answer with words and possibly equations.

(d) If I had been traveling with double the initial velocity, what distance would the car have traveled before it stopped? Assume the stopping force remains the same. Words and equations are necessary in your response, but no direct calculations are required.

Question 4. **Grade this problem? Yes or No (circle one)**

Barb is holding a big picture motionless on the wall by pushing on the picture with a force of 300 N at an angle of 30.0º as shown.



(a) Calculate the components of the push in the horizontal and vertical directions.

(b) What is the mass of the picture assuming it isn't moving?

(c) What is the magnitude and direction of the normal force acting on the motionless picture from the wall?

(d) Tired the picture begins to slide down the wall with an acceleration of magnitude 1.00 m/s^2. What is the new vertical component of the push force that Barb is applying to the picture?