General Physics
Physics 101
Test #2 – Spring 2015
Friday 3/13/15
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:

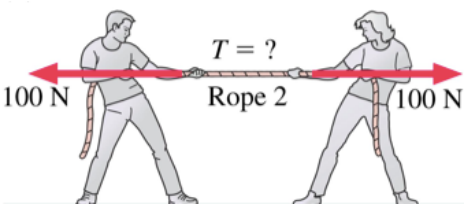
Please clearly circle one and only one answer for each of the following.
Show all of your work. Partial credit may be given if you include your work.

Questions:

1. A pickup truck with a steel bed is carrying a steel file cabinet. If the truck's speed is 15 m/s, the shortest distance the truck can stop without the file cabinet sliding is 14.3 m. What is the coefficient of friction between the truck and file cabinet?

(a) 1.6
(b) 0.60
(c) 0.054
(d) 0.80

2. Two people are playing tug-of-war, and are presently at a stand-still. What is the tension in the rope? Ignore the mass of the rope, and assume it is equally stretched.

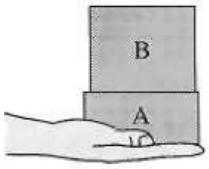


(a) 200 N
(b) 100 N
(c) -200 N
(d) 0 N

3. A 0.50 kg ball is spun in a circle at radius of 0.50 m and the centripetal acceleration of the ball is 100 m/s^2. What is the angular velocity of the motion, assuming it is traveling at constant speed?

(a) 14 rad/s
(b) 3.5 rad/s
(c) 7.1 rad/s
(d) 10 m/s

4. Block A and B are 5.0 kg and 10.0 kg respectively. As shown, these blocks are moved with a uniform acceleration of -2.0 m/s^2. What is the magnitude of the force of block A on block B?



(a) 1.2 x 10^2 N
(b) 20 kg m/s^2
(c) 78 N
(d) 59

5. On pie day tomorrow (3/14/15) I will be spinning pie plates. If a plate starts initially with a speed of 6.28 rad/s and slows to 3.14 rad/s over 15.9 revolutions, what is the angular acceleration of the system?

(a) 0.148 rad/s^2 cw
(b) – 0.930 m/s^2
(c) +0.0493 rad/s^2
(d) 3.14 rad/s^2 ccw

6. A bobsledder pushes her sled across horizontal snow to get it going, then jumps in. After she jumps in, the sled gradually slows to a halt. How many forces act on the sled just after she's jumped in? Ignore air resistance.

(a) 1
(b) 2
(c) 3
(d) 4

7. A circular disk undergoes a constant negative angular acceleration, increasing its angular speed. During this angular acceleration, what happens to the tangential acceleration of a point on the edge of the disk?

(a) Increases
(b) Remains the same
(c) Decreases
(d) Need more information

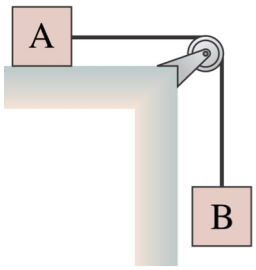
8.A block floats on a cushion of air. It is pushed to the right with a force that remains constant as the block moves from 0 to 1 and from 1 to 2 the size of the force steadily decreases until it reaches half of its initial value. For the block which of the following is true?

(a) Slows down from 1 to 2
(b) Moves at a constant speed from 0 to 1
(c) Speeds up from 1 to 2
(d) From 0 to 1, speeds up at first and then has a constant speed

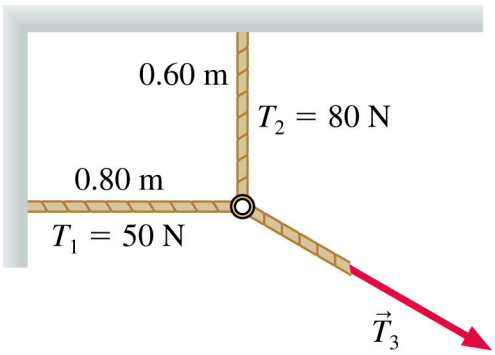
9. A block of mass, m, is pushed along the floor with velocity, v, slides a distance, d, after the pushing force is removed. What is the distance traveled if initial velocity of the block is $\sqrt{2}v$?

(a) $4d$
(b) $\frac{1}{2}d$
(c) $\sqrt{2}d$
(d) $2d$

10. Two blocks $m_A = 3.0$ kg and $m_B = 2.0$ kg are released from rest. Block A rests on a frictionless table-top, the string is massless and equally stretched, and the massless pulley has no friction. What is the net acceleration for the system?



(a) 6.5 m/s^2
(b) 3.9 m/s^2
(c) 5.9 m/s^2
(d) 9.8 m/s



11. The three ropes shown are tied to a very light ring. Two of these ropes are anchored to the walls at right angles with the tensions shown. What is the magnitude of the third tension?

(a) 0.0 N
(b) 1.3 x 10^2 N
(c) 11 N
(d) 94 N

12. You spin a 1.0 kg ball on the end of a 1.0 m long string from rest with an angular acceleration of 1.0 rad/s^2. What arc length has the ball traveled after the ball has traveled for 1.0 second?

(a) 50 cm
(b) 0.78 rev
(c) 0.50 rad
(d) 1.0 m

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 2.0 kg block is sliding down a ramp that is inclined at a 30º angle. The block's speed is increasing as it moves down the ramp. The coefficients of friction between the block and ramp are $\mu_s = 0.20$ and $\mu_k = 0.10$.

(a) Draw a force diagram showing all forces acting on the block including the net force. Be sure to label each force appropriately.

(b) Calculate the normal force acting on the block.

(c) Calculate the friction force
Explicitly state the direction (up or down the ramp).

(d) Calculate the net acceleration on the block parallel to the ramp.
Explicitly state the direction (up or down the ramp).

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

While at Great Wolf Lodge waterpark over break, there was a pipe that spun in a circle. As water filled the 1.5 m long-pipe, the water pressure caused the pipe to spin around its center. It would take 15 s for the pipe to spin from rest to its maximum speed, while it made 20 revolutions.

(a) What is the angular acceleration of the pipe as it spins up?

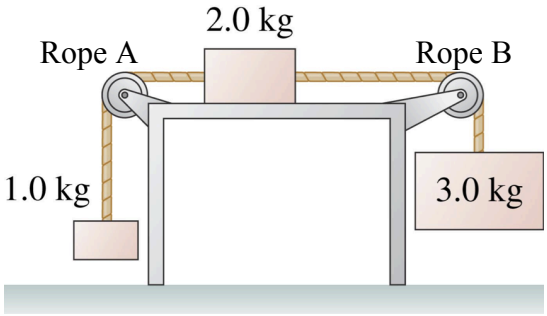
(b) What is the final angular velocity of the pipe?

(c) Once at the maximum speed, what is the acceleration of the end of the pipe? Please state the direction of the acceleration in words.

(d) Explain whether the angular velocity is the same or different for all points on the pipe? Be specific in your justification by including equations and words.

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

Three masses are connected by massless strings over massless-frictionless pulleys as shown. The tabletop is very slippery, thus you can ignore friction.



(a) What is the acceleration of the system?

(b) What is the tension in rope A?

(c) What is the net force acting on the 2.0kg mass?
Be sure to state the direction that it is acting (left/right/up/down… etc).

(d) When the system collides with the floor, it makes one heck of a dent. Which is bigger, the force of the mass on the floor or the floor on the mass? Explain.

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

On the planet of Xalkj you have taken the job of catching blalhbahs as they fall from the sky. One 10 kg blalhbah is traveling downward at 10 m/s when you catch it and steadily decrease its speed.

(a) Draw a force diagram showing the catch force and force of gravity acting on the blalhbah drawn to scale. These do not need to be exact, but a larger force should have a larger length. Also explain the direction of the net force using your diagram.

(b) If you slowed the blalhbah to a velocity of -1.0 m/s over a distance of 1.1 m, what was its acceleration (mag + dir)?

(c) If you applied 570 N of force to the blalhbah while it slowed, what is the value of "g" on Xalkj?

(d) You accidently drop the blalhbah and it impacts on the surface. If the net force it experiences is 11 kN upwards from the planet's surface, what is the acceleration of the blalhbah as it comes to rest?