General Physics
Physics 101
Test #2 – Fall 2010
Friday 10/29/10
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:

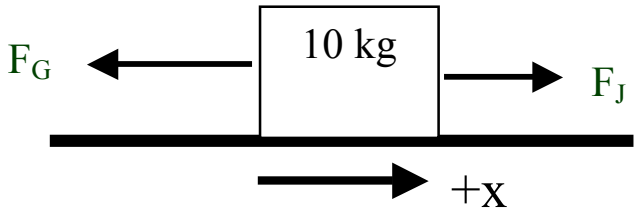
1. In lab this week, the record player while in uniform motion made 10 revolutions in 8.0 seconds. What is the angular speed of a point 12 cm away from the axis of rotation?

(a) 7.9 rad/s
(b) 0.785 rad/s
(c) 1.3 m/s
(d) 0.94 m/s

2. An object is held in place by friction on an inclined surface. The angle of incline is increased until the object starts moving. If the surface is kept at the angle, the object

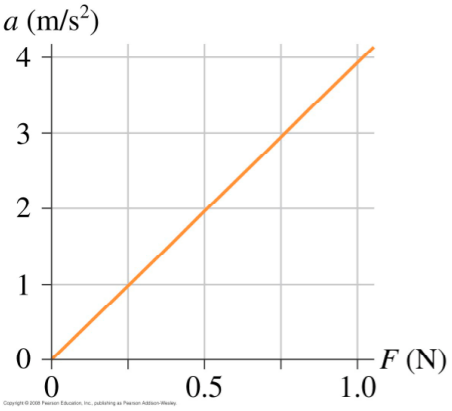
(a) slows down.
(b) moves at uniform speed.
(c) speeds up.
(d) none of the above

3. George and Jill are getting a divorce and are fighting over a 10 kg trunk. George "knows everything", so he is pulling with a force of 5.0 N, and knows the trunk is accelerating at 1.0 m/s^2. What force must Jill be pulling with for this to be the case? Pretend friction doesn't exist.



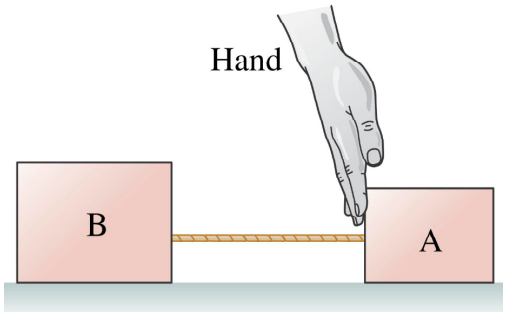
(a) 10 N
(b) 15 N
(c) 5.0 N
(d) -10 N

4. For the following acceleration vs. force graph, what is the object's mass?



(a) 4.0 kg
(b) 2.0 kg
(c) 1.0 kg
(d) 0.25 kg

5. Block A and B, with masses 1 kg and 2 kg respectively, are connected via a massless string. If the hand exerts a 9 N force on block A, what is the force exerted on mass B by the string?



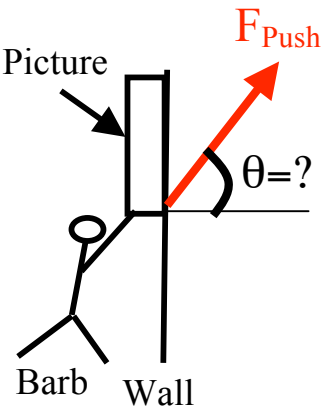
(a) 12 N
(b) 9 N
(c) 6 N
(d) 3 N

6. You have a 50.0 kg steel box sitting on a horizontal dry steel floor. If you wanted to just barely get it moving, with approximately what force would you need to apply to the box?

(a) 7.84 N
(b) 49.0 N
(c) 294 N
(d) 392 N

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

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



8. Barb is holding a big picture (m=25 kg) on the wall by pushing on the picture with a force of 300 N at an angle. For the picture not to move, what does the angle of the push have to be? Ignore Friction.

(a) 35°
(b) 48°
(c) 55°
(d) 85°

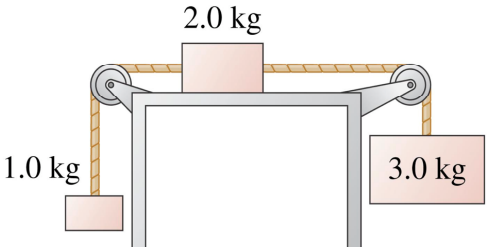
9. A block pushed along the floor with velocity, *v*, slides a distance, d, after the pushing force is removed. What is the distance traveled if the mass of the block is doubled, and it is sent with the same initial velocity as before?

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

10. Joe (50 kg) is stuck on an oil slicked floor (assumed to be frictionless), and his only option is to throw his 1.0 kg back-pack to try and help him leave the middle of the room. If he throws the backpack from rest with an acceleration of +1.0 m/s^2 over a time of 0.50 s, what is Joe's acceleration during the throw?

(a) -1.0 m/s^2
(b) -0.020 m/s^2
(c) 0.010 m/s^2
(d) 0.50 m/s^2

11. Three masses are connected by massless strings over massless-frictionless pulleys as shown. What is the acceleration of the system, assuming there is no friction between the 2.0 kg block and the table?



(a) 2.3 m/s^2
(b) 3.3 m/s^2
(c) 6.5 m/s^2
(d) 9.8 m/s^2

12. A 3.0 cm diameter drill rotates from rest to an operational angular speed of 1000 rad/s, while it experiences an angular acceleration of 100.0 rad/s^2. What is the total angular distance traveled by the drill during this process?

(a) 5.0 x 10^3 rad
(b) 5.0 rad
(c) 1.5 x 10^4 rad
(d) 5000 rad

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 wooden block is launched up a wooden ramp that is inclined at a 30º angle. The block's initial speed is 10 m/s. The coefficient of kinetic friction is 0.20 between the wooden block and wooden ramp.

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

(b) Write an equation for the net force perpendicular to the ramp, including whether the net force in the perpendicular is zero or not. Then, calculate the normal force acting on the block.

(c) Calculate the friction force ($\mu_k = 0.20$).
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)**

A 4.0 m diameter merry-go-round accelerating uniformly from rest achieves its operating speed of 2.5 rpm in 5.0 seconds.

(a) What is the magnitude of the angular acceleration?
Is it in the same direction or opposite direction of the angular velocity?

(b) What angular distance did the merry-go-round travel?

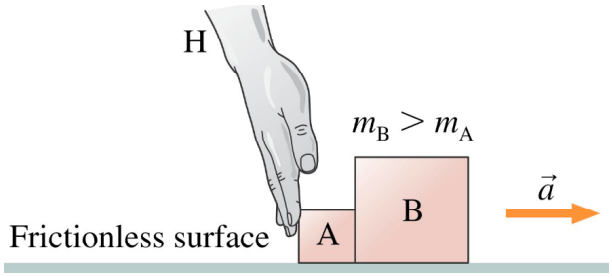
Once at the operational speed, you decide to sit at the edge of the merry-go-round.

(c) What centripetal acceleration (magnitude and direction) do you experience as you spin around, and around and around and around and around and around and around?

(d) During one full revolution, if you would have sat towards the center of the merry-go-round, say at half the radius, would you have traveled a shorter or longer distance in comparison to if you were sitting at the edge? Words are necessary and equations with calculations may help, but are not required.

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

Two blocks with masses m_A=5.0 kg and m_B = 10.0 kg are pushed on a frictionless surface with a force of 15.0 N as shown.



(a) Draw a force diagram for the hand, block A and block B, including all horizontal forces (no vertical forces are necessary). Be sure to use proper labels for each force.

(b) Determine the net acceleration of the system.

(c) Determine the force (mag & dir) of mass B on mass A.

(d) Determine the net force (mag & dir) acting on block A.

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

You've inherited a 5.0 kg square steel block on a string. It is presently sitting on a sheet of ice, which we will consider to be a frictionless surface.

(a) What horizontal tension in the rope is necessary to keep the block at rest. Be sure to justify and/or explain your answer.

(b) You pull the block into the air freeing it from the ice and accelerate it vertically with a 2.0 m/s^2 acceleration. What is the tension in the string while it is accelerating?

(c) Unfortunately the string breaks and the mass falls. As it hits the ground it makes a large dent in the floor. Which was greater, the force of the block on the floor or the floor on the block? Explain your answer.

(d) You now hang the mass from a spring scale as shown. What is the reading on the scale in Newtons? Be sure to justify and/or explain your answer.