

General Physics
Physics 101
Test #2 – Spring 2012
Friday 3/2/12
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 wheel is rotating with a clockwise angular velocity of 6.0 rad/s , it experiences a counter-clockwise angular acceleration of 2.0 rad/s^2 for 2.0 s . What is the final angular velocity of the wheel?

- (a) -2.0 rad/s
- (b) -10.0 rad/s
- (c) -4.0 rad/s
- (d) 4.0 rad/s

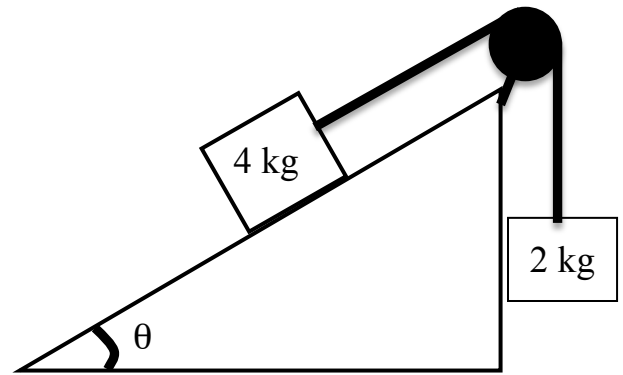
2. When Chuck Norris (75 kg) does a pushup, he isn't lifting himself up, he's pushing the Earth down. If he pushes with an average force of 1000 N over a time and the earth's mass is $6.0 \times 10^{24} \text{ kg}$, what is the acceleration of the earth?

- (a) $1.667 \times 10^{-22} \text{ m/s}$
- (b) $6.2 \times 10^{-22} \text{ m/s}^2$
- (c) 13.3 m/s^2
- (d) $1.7 \times 10^{-22} \text{ m/s}^2$

3. A 4.0 kg block sits motionless on a 40° incline. What is the coefficient of friction between the ramp and incline?

- (a) 0.84
- (b) 1.1 N
- (c) 0.64
- (d) 0.77

4. A 4.0 kg box is on a frictionless 20° ramp and is connected via a massless string over a massless, frictionless pulley to a hanging 2.0 kg weight. If you gently release the box, which way will it move on the ramp?



- (a) Up the ramp
- (b) Down the ramp.
- (c) It will not move.
- (d) Need more information

5. A space station is constructed as a 1000-m-diameter rotating cylinder that rotates about its axis. To create artificial gravity on the outer deck, what rotation period will provide an acceleration equivalent to “normal” gravity?

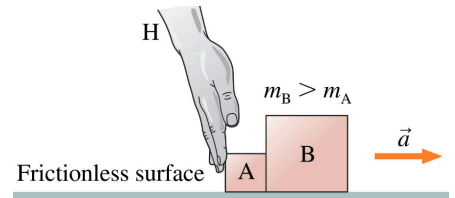
- (a) 70 s
- (b) 45 s
- (c) 64 s
- (d) 0.090 s

6. You are pulling a 100 kg wooden block across a wooden floor against friction at an acceleration of 2.0 m/s^2 . Your pull force is _____ in comparison to the net force.

- (a) the same as
- (b) greater than
- (c) less than
- (d) need more information

7. 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) $\sqrt{2}d$



8. Two blocks are pushed by a hand, which of the following net force equations is not possible for the system.

- (a) $\sum F_B = m_B a = F_{BonA}$
- (b) $\sum F_A = m_A a = F_{Hand} - F_{BonA}$
- (c) $\sum F_{tot} = (m_A + m_B) a = F_{Hand}$
- (d) $\sum F_{tot} = m_{tot} a = F_{Hand} - F_{AonB} + F_{BonA}$

9. I was driving down Glamorgan on Tuesday and saw a cop coming towards me. Before I saw the cop, I was traveling at 10.0 m/s and after seeing him I slowed to 5.0 m/s over a distance of 10 m. If my car is 800 kg, what force was applied to my car during this motion? Upon conversation with said cop, I got a warning.

- (a) 8000 N
- (b) -2.0×10^2 N
- (c) -3.0×10^3 N
- (d) 8.0×10^3 N

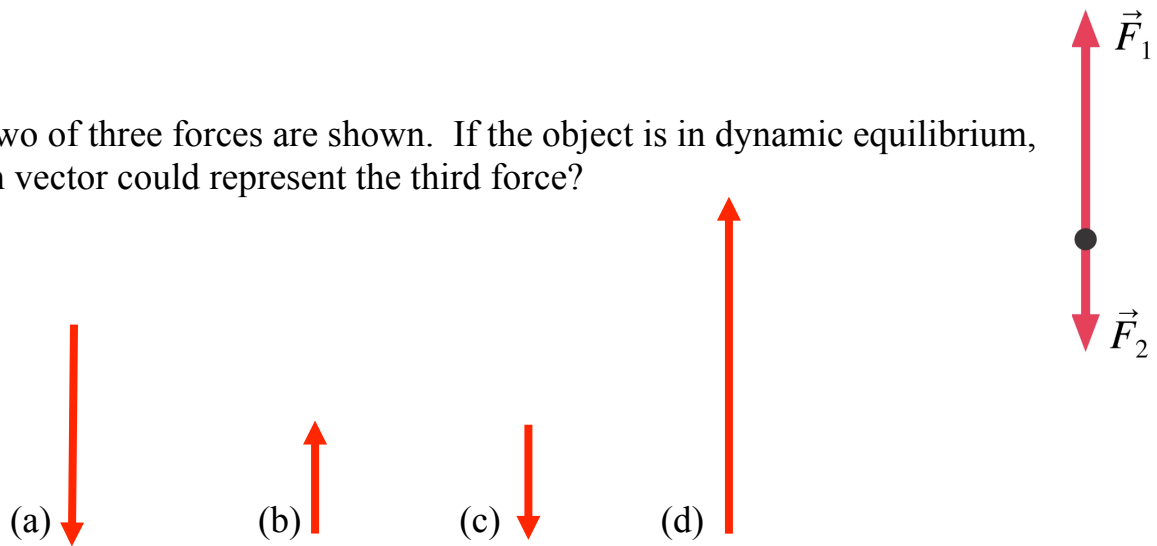
10. Which of the following statements is true?

- (a) When breaking a board with your hand, the force the hand exerts on the board is bigger than the force the board exerts on the hand.
- (b) In uniform circular motion there is no acceleration.
- (c) Friction always points in the opposite direction of motion.
- (d) Two points on a rigid wheel undergoing an angular acceleration always have the same angular velocity at a given time.

11. A bicycle wheel rotates with a constant angular speed of 60 rpm. Through what angle does the wheel turn through in 60 seconds?

- (a) 360 radians
- (b) 60 revolutions
- (c) 376.9 radians
- (d) 592 revolutions

12. Two of three forces are shown. If the object is in dynamic equilibrium, which vector could represent the third force?



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 car starts from rest on a curve with a radius of 120 m and accelerates continually at 1.0 m/s^2 .

- (a) What is the angular acceleration of the car as it goes around the curve?
- (b) At the point in the cars trip around the curve when the magnitude of the centripetal acceleration is 1.7 m/s^2 , what is the angular velocity?
- (c) At the point in (b), through what angle has the car traveled from rest?
- (d) At the point in (b) explain the direction that the total acceleration points.

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

A 1.0 kg and 2.0 kg block are being pushed by a force being applied to the 1.0 kg block causing the system to accelerate at 1.0 m/s^2 .

(a) What is the force (mag + dir) of the 2.0 kg block acting on the 1.0 kg block?

(b) What is the net force (mag + dir) acting on the 1.0 kg block?

(c) You remove the push force and the blocks explode apart (why, I don't know), during the explosion which block experiences a larger acceleration? Explain your answer with words and possibly a diagram, no calculations are necessary.

(d) If the 2.0 kg block leaves the explosion with a velocity of 2.0 m/s and slows to a stop due to a coefficient of friction of 0.20. What is the magnitude of the friction force?

Question 3.

Grade this problem? Yes or No (circle one)

While at Akron Children's Hospital waiting for my son to finish surgery, I observed the elevators outside the waiting area. I measured the elevator's operational speed to be 2.0 m/s, and it took 1.0 second to reach the operational speed from rest.

(a) If the elevator has a mass of 1,000 kg, what is the tension in the cable holding the elevator when it is at rest?

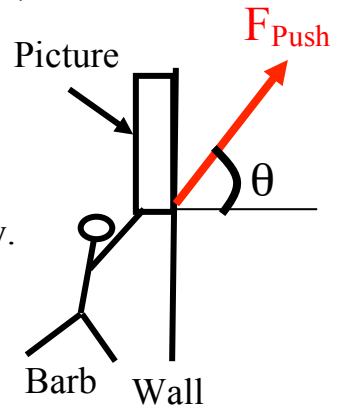
(b) What is the acceleration of the elevator if it is moving upward?

(c) What is the tension in the cable holding the elevator when it is accelerating upward?

(d) If the elevator is traveling downward at constant velocity, which is bigger the magnitude of the force of gravity or the tension in the cable? Please explain your answer with words and possibly a diagram.

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 as shown which has a magnitude of 300 N and an angle of 30.0° . Ignore friction for (a) – (c)



(a) Draw a force diagram showing all forces acting on the picture. Be sure to include/state the net force and label each force appropriately.

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

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

(d) If you were to take into account friction, a little bit of extra force in the vertical direction would cause the picture to move up the wall. Prior to moving, in what way would the friction point? Justify your answer with words and possibly a diagram.