PHY205-H1S	**Test 1**	Prof. Jason Harlow
"The Physics of Everyday Life"	2pm – January 30, 2013 – **Version 2**	Physics Department, University of Toronto

Last Name: ____________________ First Name:__________________________.

Student Number: ________________ Tutorial (circle) M6 W6 F10 F12 T.A.:_________________.

This test has 5 pages and should take no longer than 50 minutes. You may use a calculator and one 5"×3" index card with your own hand-written notes, if you wish. Assume that the acceleration due to gravity in all problems is g = 10 m/s^2. Neglect air resistance in all questions, unless otherwise indicated. Good luck!

Written Answer Part

Please answer the following questions. Show all your reasoning and work legibly in the blank space provided, and write your final numerical answers in the boxes provided. For final numerical answers be sure to include units, and direction if the quantity is a vector. You may use the back of the page for rough work which will not be graded.

Written A:	/4
Written B:	/4
Written C:	/4
+ 12 multiple choice worth 2 points each. Test total possible is 36.	

A. Amy is driving in her car at a velocity of 30 m/s to the North. The mass of Amy and her car is 1000 kg. Jon is driving in his car at a velocity of 30 m/s to the East. The mass of Jon and his car is also 1000 kg. Jon is texting, so he does not see the red light, and Jon and Amy's cars collide! When the cars collide, they stick together.

   i. Immediately after the collision, in what direction do the two stuck-together cars travel?

   ii. Immediately after the collision, what is the speed of the two stuck-together cars?

B. Adrian is in the airport, pulling a suitcase with a force of 100 N to the right. Adrian and the suitcase are both moving at a constant velocity of 2 m/s to the right. The suitcase has a mass of 20 kg, and Adrian has a mass of 60 kg.

i. What is the force of the suitcase on Adrian?

ii. What is the acceleration of the suitcase?

iii. What is the force of friction of the floor on the suitcase?

iv. What is the force of friction of the floor on Adrian?

C. You wish to use a force on a wrench in order to turn a nut. The nut is very sticky, so you wish to apply as much torque as possible to the nut. What are the three important properties of the force which determine the amount of torque, and how would you adjust these properties to maximize torque?

Property 1
Property 2
Property 3

Multiple Choice Part (2 points per question)
Please fill your answers in on the provided answer-sheet. Be sure to fill in the identifying information on the top of your answer sheet. You may use pen or pencil when filling in the circles. IMPORTANT: There are multiple versions of this test. On your bubble sheet, please fill in **2** for version.

1. A man weighing 800 N stands at rest on two bathroom scales so that his weight is distributed evenly over both scales. What is the reading on each scale?
   A. 200 N
   B. 800 N
   C. 1600 N
   D. 100 N
   E. 400 N

2. A car accelerates at 2 m/s^2. Assuming the car starts from rest, how far will it travel in 10 s?
   A. 10 m
   B. 100 m
   C. 200 m
   D. 2 m
   E. 40 m

3. Two identical eggs fall the same distance and then stop. One stops by hitting a hard floor, and breaks. The other stops by hitting a soft exercise mat, and does not break. What are the answers to the following three questions regarding the stopping of these two eggs? 1. Do both eggs experience the same change in momentum? 2. Do both eggs experience the same impulse? 3. Do both eggs experience the same force?
   A. No to 1 and 2. Yes to 3.
   B. Yes to 1 and 2. No to 3.
   C. Yes to 1, 2 and 3.
   D. No to 1, 2 and 3.
   E. Yes to 1. No to 2 and 3.

4. A pitcher throws a baseball. Consider the action force to be the pitchers hand against the ball. What is the reaction to this force?
   A. Air resistance against the ball.
   B. The force of the pitcher's arm upon his hand.
   C. The force of the ball against the pitcher's hand.
   D. The combined weight of the ball and the pitcher's hand.
   E. Friction of the ground acting on the pitcher's feet.

5. Edward lifts a container a vertical distance of 1 metre in a time of 1 second. Later, Jessica rolls the same container up a 2 metre-long ramp, covering the same vertical distance of 1 metre, and it takes her 2 seconds. While they are applying a force to the container, how do the forces compare?
   A. Jessica applies about half as much force to the container as Edward.
   B. Edward applies about half as much force to the container as Jessica.
   C. Edward applies about four times as much force to the container as Jessica.
   D. Jessica applies about four times as much force to the container as Edward.
   E. Jessica and Edward apply about the same amount of force to the container.

6. Two children are sitting on a platform that is rotating. Kevin is sitting 1 m away from the rotation axis. Sonia is sitting 2 m away from the rotation axis. Which of the following statements is true?
   A. Both children have the same rotational speed, but Sonia has a greater tangential speed than Kevin.
   B. Sonia's rotational speed is greater than Kevin's, and her tangential speed is also greater than Kevin's.
   C. Both children have the same tangential speed, but Kevin has a greater rotational speed than Sonia.
   D. Both children have the same rotational speed and tangential speed.
   E. Both children have the same tangential speed, but Sonia has a greater rotational speed than Kevin.

7. If the net force acting on a moving object is zero,
   A. it will continue moving at the same velocity.
   B. it will accelerate downward at 10 m/s^2.
   C. its velocity will continue changing with a constant value of acceleration.
   D. it will continue moving at the same speed, but not necessarily in the same direction.
   E. it will move slower and slower until it finally stops.

8. When a rock thrown straight upwards gets to the exact top of its path, its
   A. speed is zero and the magnitude of its acceleration is about 10 m/s^2.
   B. speed is about 10 m/s and the magnitude of its acceleration is about 10 m/s^2.
   C. speed is zero and its acceleration is zero.
   D. speed is about 10 m/s and its acceleration is zero.
   E. none of these

9. A 5 kg brick and a 0.5 kg pillow are thrown out the second-story window of a building. Which of the following statements is true for the two objects as they fall?
   A. The forces of gravity on the brick and the pillow are the same.
   B. The force of gravity on the pillow is slightly larger than the force of gravity on the brick.
   C. The force of gravity is 10 times greater on the pillow than the brick.
   D. The force of gravity is 10 times greater on the brick than the pillow.
   E. The force of gravity on the brick is slightly larger than the force of gravity on the pillow.

10. If an object of constant mass experiences a constant non-zero net force, what else about it will be constant?
   A. speed
   B. position
   C. velocity
   D. acceleration
   E. more than one of the above

11. The driver of a car sees a traffic light turn green and begins to accelerate. While the car is speeding up, what is the main force contributing to the net force which accelerates the car?
   A. Force of the engine acting on the axles of the wheels.
   B. Resistance of the air acting on the car.
   C. Normal force of the driver's foot acting on the accelerator pedal.
   D. Static friction of the road acting on the wheels.
   E. Thrust force of the exhaust acting on the car.

12. A coffee mug filled with coffee has a total mass of 1 kg. It starts at rest, and falls from a shelf that is 2 m above the floor. Just before the coffee mug hits the floor, what is its kinetic energy?
   A. 1 J
   B. 10 J
   C. 20 J
   D. zero
   E. 2 J