

Instructor(s): *C. Parks*PHYSICS DEPARTMENT
EXAM 1

PHY2053, Summer 2016

June 7, 2016

Name (print, last first): _____ Signature: _____

*On my honor, I have neither given nor received unauthorized aid on this examination.***YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.**

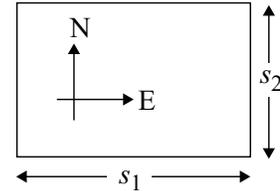
- (1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number).** Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY.** Code your UFID number on your answer sheet.
- (2) Print your name on this sheet and sign it also.
- (3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.
- (4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink.** Do not make any stray marks or some answers may be counted as incorrect.
- (5) **The answers are rounded off. Choose the closest to exact. There is no penalty for guessing. If you believe that no listed answer is correct, leave the form blank.**
- (6) Hand in the answer sheet separately.

Given Information:

$$g = 9.81 \text{ m/s}^2 \quad G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2 \quad 1 \text{ kg} = 1000 \text{ g} \quad 1 \text{ m} = 100 \text{ cm}$$

$$1 \text{ hour} = 60 \text{ minutes} \quad 1 \text{ minute} = 60 \text{ seconds} \quad 1 \text{ rev} = 2\pi \text{ radians} \quad \pi \text{ radians} = 180^\circ$$

1. Today you are beginning your workout plan. As the commerial said, "Some athletes train to run and some athletes run to train, but all athletes run." You will begin by running around the block shown. The dimensions are $s_1 = 0.35 \text{ mi}$ and $s_2 = 0.20 \text{ mi}$. Donning your new, very expensive running shoes, you start in the southwest corner of the block (lower left corner in the diagram) head east and run for 1.3 miles in a very respectable 15 minutes. Breathing hard but remembering your physics, you calculate your average velocity for the run.



- (1) 0.80 mph East (2) 5.2 mph East (3) 0.80 mph North (4) 5.2 mph North (5) None of these.
2. The first object has an initial speed of 0.30 m/s and accelerates uniformly in a straight line for 8.0 s until reaching 0.80 m/s. A second object has twice the acceleration of the first. It also starts at 0.30 m/s and travels for 8.0 s. How far does the second object travel in the 8.0 s?
- (1) 6.40 m (2) 2.24 m (3) 2.90 m (4) 2.65 m (5) None of these.
3. While visiting Paynes Prairie, you climb the observation tower. Half way up the tower you drop a pebble and it takes 1.20 s to hit the ground. If you drop a pebble from the top of the tower, how long will it take the pebble to hit the ground? Round the answer to 3 significant figures.
- (1) 1.70 s (2) 1.95 s (3) 2.15 s (4) 2.40 s (5) None of these.
4. The running back breaks free. He runs for 20 yards due N, then runs 45° W of N for another 30 yards before being tackled. What is the magnitude of his displacement? Round your answer to 2 significant figures.
- (1) 46 yards (2) 50 yards (3) 36 yards (4) 63 yards (5) None of these.
5. A dolphin wants to swim directly to its home bay, which is 0.80 km due west. It can swim at a speed of 4.00 m/s relative to the water, but a uniform water current flows with speed 2.83 m/s to the south. What direction should the dolphin head?
- (1) 45.0° W of N (2) 35.3° W of N (3) 54.7° W of N (4) 60.0° W of N (5) None of these.

6. A golf ball is hit from the ground at 35 m/s at an angle of 55° . The ground is level. What is the (a) maximum height of the ball and (b) its speed at the highest point? The answers are rounded to 2 significant figures.

- (1) (a) 42 m, (b) 20 m/s
 (2) (a) 42 m, (b) 29 m/s
 (3) (a) 120 m, (b) 20 m/s
 (4) (a) 120 m, (b) 29 m/s
 (5) None of these.

7. Which is Newton's third law?

- (1) In an interaction between two objects, each object exerts a force on the other. These two forces are equal in magnitude and opposite in direction.
 (2) $F = Gm_1m_2/r^2$
 (3) An object's velocity vector remains constant if and only if the net force acting on the object is zero.
 (4) An object's acceleration is proportional to the net force acting on it and inversely proportional to its mass. The acceleration and net force are in the same direction.
 (5) None of these.

8. A block of mass m is placed on a horizontal table. The coefficient of static friction between the block and the table is 0.80 and the coefficient of kinetic friction is 0.50. Find the value of m if the block moves at constant speed when $F = 49$ N.

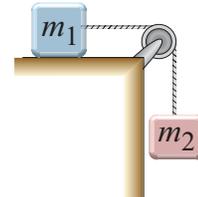


- (1) 10.0 kg (2) 6.25 kg (3) 98.0 kg (4) 61.3 kg (5) None of these.

9. A block slides down a frictionless plane inclined at θ relative to the horizontal. The block accelerates at $0.34g$. Rounded to two significant digits, what is θ ?

- (1) 20° (2) 15° (3) 25° (4) 30° (5) None of these.

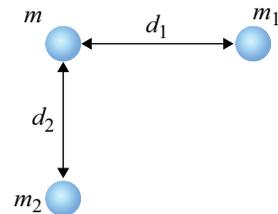
10. Suppose that $m_1 = 2.67$ kg and $m_2 = 4.34$ kg. What is the coefficient of kinetic friction between m_1 and the table if the blocks move with constant speed? Answers are rounded to 3 significant figures.



- (1) 1.63
 (2) 0.615
 (3) 1.67
 (4) 0.822
 (5) None of these.

11. Find the magnitude of the net gravitational force acting on mass m .

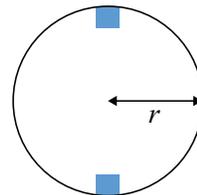
- (1) $\sqrt{\left(\frac{Gmm_1}{d_1^2}\right)^2 + \left(\frac{Gmm_2}{d_2^2}\right)^2}$
 (2) $\sqrt{\left(\frac{Gmm_1}{d_1^2}\right)^2 - \left(\frac{Gmm_2}{d_2^2}\right)^2}$
 (3) $\frac{Gmm_1}{d_1^2} + \frac{Gmm_2}{d_2^2}$
 (4) $\frac{Gmm_1}{d_1^2} - \frac{Gmm_2}{d_2^2}$
 (5) None of these.



12. A bicycle is traveling at 8.94 m/s. The diameter of the bicycle's wheel is 0.60 m. What is the angular speed of the wheel?

- (1) 29.8 rad/s (2) 14.9 rad/s (3) 8.94 rad/s (4) 4.47 rad/s (5) None of these.

13. The ride at the county fair has a car traveling in a vertical circle as shown. At the bottom of the circle, your apparent weight is 3 times its normal value (mg). What is your apparent weight at the top? Assume that the car has the same speed throughout the ride.



- (1) $1.0 mg$ (2) $0 mg$ (3) $0.50 mg$ (4) $1.5 mg$ (5) None of these.

14. A 0.50-m radius wheel has initial angular speed of 60 rad/s. The power is turned off to the wheel, and it slows to a stop with constant angular acceleration in 2.0 minutes. What is the tangential acceleration of a point on the edge of the wheel 1.0 minutes after the power is turned off?

- (1) 0.25 m/s^2 (2) 450 m/s^2 (3) 4.0 m/s^2 (4) 250 m/s^2 (5) None of these.

15. Initially, a disk spins at 2.0 rad/s. After 10 s, it is spinning at 8.0 rad/s. Assuming that the angular acceleration is constant, what is the disk's angular displacement after 30 s?

- (1) 330 rad (2) 270 rad (3) 69 rad (4) 380 rad (5) None of these.