

Instructor(s): *C. Parks*PHYSICS DEPARTMENT
Final Exam

PHY2053, Summer 2016

August 4, 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:

$$g = 9.8 \text{ m/s}^2 \quad 1 \text{ atmosphere} = 1.01 \times 10^5 \text{ Pa} \quad \text{Density of water} = 1000 \text{ kg/m}^3$$

$$1 \text{ m} = 100 \text{ cm} \quad 1 \text{ minute} = 60 \text{ seconds}$$

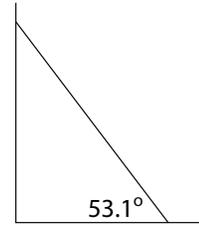
1. The vector \vec{A} has magnitude 15 m and points at 15° counterclockwise from the $+x$ -axis. The vector \vec{B} also has magnitude 15 m and is directed at 135° . Find the magnitude of $\vec{A} + \vec{B}$.
 (1) 15 m (2) 21 m (3) 30 m (4) 10 m (5) None of these.
2. A car starts from rest and accelerates uniformly. The car travels 200 m in 10 s. The driver applies the brakes and stops the car in 5.0 s. What is the magnitude of the constant rate of slowing of the car?
 (1) 8.0 m/s^2 (2) 4.0 m/s^2 (3) 6.0 m/s^2 (4) 2.0 m/s^2 (5) None of these.
3. A rock is thrown horizontally from the second floor balcony of a hotel, a height of 19.6 m above the ground. If the rock's initial velocity is 6.0 m/s , how far from the base of the hotel does the rock hit the ground? The ground is level and the wall of the hotel goes straight down from the balcony.
 (1) 12 m (2) 6.0 m (3) 9.8 m (4) 19.6 m (5) None of these.
4. A 15-kg block is given a push across a horizontal floor. The block then slides across the floor and comes to a stop. The coefficient of static friction between the floor and the block is 0.80 and the coefficient of kinetic friction between the floor and the block is 0.50. What is the magnitude of the acceleration of the block?
 (1) 4.90 m/s^2 (2) 7.35 m/s^2 (3) 9.80 m/s^2 (4) 1.96 m/s^2 (5) None of these.
5. A car drives around a circular track with radius $R = 300 \text{ m}$ and completes a lap in 42 s. To three significant figures, what is the radial force acting on the 80-kg driver?
 (1) 537 N (2) 269 N (3) 171 N (4) 734 N (5) None of these.
6. A ball dropped from height h hits the ground with velocity v . At what height is the velocity $3v/4$?
 (1) $7h/16$ (2) $9h/16$ (3) $3h/4$ (4) $11h/16$ (5) None of these.

7. An 8.0-kg object sliding at 6.0 m/s collides head on with a stationary 4.0-kg object. The collision is one-dimensional and inelastic. After the collision the 4.0-kg object travels at 8.0 m/s. Find the magnitude of the impulse acting on the 8.0-kg object.

- (1) 32 N-s (2) 16 N-s (3) 64 N-s (4) 48 N-s (5) None of these.

8. A 10-foot ladder is leaning against the wall as shown. The ladder is uniform and its center of mass is at its center. The wall pushes against the ladder with a force of 12 pounds. Find the weight of the ladder.

- (1) 32 pounds
 (2) 24 pounds
 (3) 18 pounds
 (4) 12 pounds
 (5) None of these.



9. A cylindrical ($I = MR^2/2$) turntable has mass 50 kg and radius 0.80 m. The turntable is mounted so that it rotates about its central axis. Initially, the turntable is at rest. A torque acts on the turntable causing it to rotate at 15 rad/s after 6.0 s. What is the net torque acting on the turntable?

- (1) 40 N-m (2) 80 N-m (3) 60 N-m (4) 100 N-m (5) None of these.

10. An industrial fan is made of 6 fan blades that can be approximated as three long rods ($I = ML^2/12$) rotating about their centers. Each rod is 3.0 m long and has mass 15 kg. The fan is rotating at 60 revolutions/minute when a rod breaks and two blades fall from the fan. The fan now has 4 blades instead of 6. Assuming the angular momentum is conserved, what is the new rotational speed of the fan?

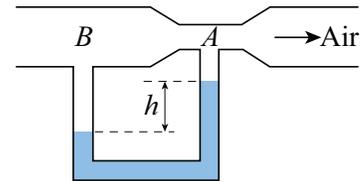
- (1) 90 revolutions/min
 (2) 40 revolutions/min
 (3) 80 revolutions/min
 (4) 120 revolutions/min
 (5) None of these.

11. A fluid is used in a barometer and reaches a height of 7.0 m in one atmosphere. Which object will sink in the fluid?

- (1) Volume = 0.050 m³, Mass = 80 kg
 (2) Volume = 0.020 m³, Mass = 20 kg
 (3) Volume = 0.040 m³, Mass = 44 kg
 (4) Volume = 0.050 m³, Mass = 60 kg
 (5) None of these.

12. Where is the pressure highest and the air velocity highest?

- (1) B, A
 (2) B, B
 (3) A, B
 (4) A, A
 (5) None of these.

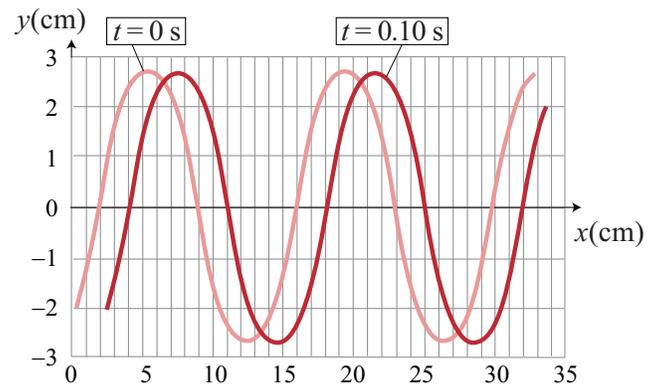


13. When a 10-kg mass is attached to a spring, the spring stretches by 0.049 m. Another 5.0 kg is added to the mass. What is the frequency of the new combination?

- (1) 11.5 rad/s (2) 14.1 rad/s (3) 20.0 rad/s (4) 10 rad/s (5) None of these.

14. What is the frequency of the traveling wave?

- (1) 1.3–1.5 Hz
- (2) 13–15 Hz
- (3) 19–21 Hz
- (4) 0.60–0.80 Hz
- (5) None of these.



15. A one meter tube open at both ends resonates at its fundamental frequency. The E string on a guitar has a mass per unit length of 4.5×10^{-4} kg/m and it resonates at the same frequency. What is the tension in the string if it is also 1.0 m long? The speed of sound is 340 m/s.

- (1) 52 N
- (2) 74 N
- (3) 37 N
- (4) 104 N
- (5) None of these.