

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

August 9, 2012

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.**

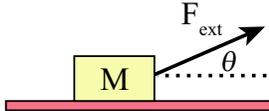
- (1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number).** Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY.** Code your UFID number on your answer sheet.
- (2) Print your name on this sheet and sign it also.
- (3) Do all scratch 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:

$$g = 9.80 \text{ m/s}^2 \quad \text{cylinder } I = MR^2/2 \quad \text{speed of sound} = 340 \text{ m/s} \quad A = \pi r^2 \quad 1 \text{ m} = 100 \text{ cm}$$

1. The x -component of $\vec{A} + \vec{B}$ is +10 N. Which two vectors can be \vec{A} and \vec{B} ? In the list below, the first vector is \vec{A} and the second \vec{B} . The angles are measured counterclockwise from the $+x$ -axis.
 - (1) 7.21 N at 56.3° and 7.21 N at 33.7°
 - (2) 7.81 N at 50.2° and 8.73 N at 23.6°
 - (3) 8.85 N at 42.7° and 8.00 N at 25.9°
 - (4) 6.26 N at 28.6° and 10.0 N at 53.1°
 - (5) None of these.

2. A speeding car passes a state trooper hidden behind a tree. The car is traveling at a constant 36 m/s (about 80 mph). The trooper, starting from rest, accelerates at a constant rate until he catches up to the car. If the pursuit takes place over a distance of 864 m, what is the acceleration of the trooper?
 - (1) 3.0 m/s³
 - (2) 6.0 m/s³
 - (3) 12.0 m/s³
 - (4) 1.5 m/s³
 - (5) None of these.

3. A block of mass $M = 3 \text{ kg}$ slides along the floor while an external force F_{ext} is applied at an upward angle $\theta = 35^\circ$. The coefficient of kinetic friction between the block and the floor is 0.5 and the block travels at constant speed. What is the magnitude of the external force F_{ext} ?
 
 - (1) 13 N
 - (2) 15 N
 - (3) 11 N
 - (4) 1.4 N
 - (5) None of these.

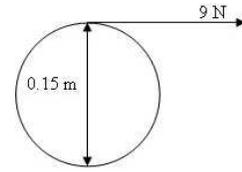
4. A car drives around an unbanked curve with a 410 m radius at 32 m/s. The mass of the car is 1400 kg. What is the frictional force on the car? The coefficient of static friction is 0.4.
 - (1) 3500 N
 - (2) 5500 N
 - (3) 110 N
 - (4) 560 N
 - (5) None of these.

5. At the top of the hill, a sled is moving at 5 m/s. Later it is moving at 20 m/s. How far did the sled descend?
 - (1) 19 m
 - (2) 0.77 m
 - (3) 1.5 m
 - (4) 15 m
 - (5) None of these.

6. On a greasy, essentially frictionless lunch counter, a 0.500-kg submarine sandwich, moving at 2.0 m/s to the left, collides with a 0.250-kg grilled cheese sandwich moving 1.20 m/s to the right. If the two sandwiches stick together, what is their final velocity?

(1) 1.6 m/s left (2) 1.6 m/s right (3) 2.4 m/s left (4) 2.4 m/s right (5) None of these.

7. A cable is wrapped around a uniform solid cylinder that can rotate about its axis. The cylinder has a 0.15 m diameter and a 25 kg mass. The cable is pulled with a 9 N force. What is the angular acceleration of the cylinder?



(1) 9.6 rad/s² (2) 4.8 rad/s² (3) 32 rad/s² (4) 0.36 rad/s² (5) None of these.

8. At one point in a pipeline the water's speed is 3.00 m/s and the pressure is 5.00×10^5 Pa. Find the pressure at the second point in the line, 11.0 m lower than the first, if the pipe's cross-sectional area at the second point is twice that of the first. (Hint: Speed of the water changes if the area of the pipe changes.)

(1) 1.61×10^5 Pa (2) 1.58×10^5 Pa (3) 1.44×10^5 Pa (4) 1.01×10^5 Pa (5) None of these.

9. A nylon rope used by mountaineers elongates 1.10 m under the weight of a 65-kg climber. If the original length of the rope is 45 m and it is 7.00×10^{-3} m in diameter, what is Young's modulus for the rope?

(1) 6.8×10^8 Pa (2) 6.9×10^7 Pa (3) 1.7×10^8 Pa (4) 1.7×10^7 Pa (5) None of these.

10. An object of mass m is attached to a horizontal spring, stretched to a displacement A from equilibrium and released, undergoing oscillations on a frictionless surface with period T_0 . The experiment is repeated with a mass $4m$. What is the new period of the oscillation?

(1) $2T_0$ (2) $4T_0$ (3) $T_0/2$ (4) $T_0/4$ (5) None of these.

11. The equation for a traveling wave is $y = (7 \text{ cm})\sin[(200 \text{ rad/s})t - (4.00 \text{ rad/m})x]$. What is the speed of the wave?

(1) 50 m/s (2) 800 m/s (3) 340 m/s (4) 56 m/s (5) None of these.

12. The second harmonic in a pipe open at both ends is 1000 Hz. How long is the pipe?

(1) 0.34 m (2) 0.17 m (3) 2.9 m (4) 5.9 m (5) None of these.