

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

June 12, 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:

$$g = 9.80 \text{ m/s}^2$$

$$1 \text{ day} = 24 \text{ hours}$$

$$G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$$

$$1 \text{ hour} = 60 \text{ minutes}$$

$$1 \text{ mile} = 5280 \text{ ft}$$

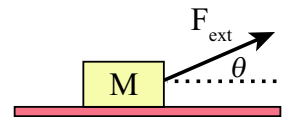
$$1 \text{ minute} = 60 \text{ seconds}$$

$$1 \text{ year} = 365 \text{ days}$$

$$C = 2\pi r$$

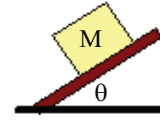
1. The period of a simple pendulum is proportional to the square root of its length. By what factor must the length of the pendulum be changed to increase its period by a factor of 1.5?
 - (1) 2.25
 - (2) 1.5
 - (3) 1.22
 - (4) 0.44
 - (5) None of these.
2. Convert 60 miles/hour into feet/second.
 - (1) 88.0 ft/s
 - (2) 40.9 ft/s
 - (3) 5280 ft/s
 - (4) 0.682 ft/s
 - (5) None of these.
3. A truck is driving down the highway. While the traffic is light, the truck travels at 70 miles/hour for 45 minutes. In heavier traffic, the truck travels at 50 miles/hour for 30 minutes. What is the average velocity of the truck?
 - (1) 62 miles/hour
 - (2) 60 miles/hour
 - (3) 58 miles/hour
 - (4) 56 miles/hour
 - (5) None of these.
4. While driving down Museum Road, you see Mr. Parks crossing the road. Seeing your opportunity, you accelerate from 9.0 m/s (about 20 miles/hour) to 15 m/s in a distance of 20 m. What is the acceleration of your car?
 - (1) 3.6 m/s²
 - (2) 0.30 m/s²
 - (3) 7.2 m/s²
 - (4) 9.8 m/s²
 - (5) None of these.
5. Bowser is on a 25 m tall cliff that overlooks Princess. He drops a cylindrical cage with radius 3 m from the cliff directly above Princess. Mario sees Bowser and warns Princess. If the cage is dropped at the same instant that Princess hears Mario's warning, what is the minimum acceleration she needs so that the cage misses her? Assume Princess is standing still directly below the center of the cage when it is dropped.
 - (1) 1.18 m/s²
 - (2) 2.34 m/s²
 - (3) 0.59 m/s²
 - (4) 1.84 m/s²
 - (5) None of these.
6. Standing on a bridge, you throw a stone straight upward. The stone hits a stream, 37 m below the point at which you release it, 3.7 seconds later. What is the velocity of the stone after it leaves your hand?
 - (1) 8.13 m/s
 - (2) 28.1 m/s
 - (3) 5.18 m/s
 - (4) 16.4 m/s
 - (5) None of these.

7. While playing golf, you hit your tee shot 150 yards 30° E of N. Your second shot is 120 yards at 45° W of N. What is the overall direction of your two shots from the tee?
- (1) 3° W of N (2) 3° E of N (3) 75° W of N (4) 15° E of N (5) None of these.
8. Three forces are acting on an object. One force is 50 N directed at 30° above the x -axis. Another force is 70 N along the $+y$ -axis. What is the magnitude and direction of a third force so that the object is in equilibrium?
- (1) 104 N at 245° (2) 104 N at 65° (3) 120 N at 60° (4) 120 N at 240° (5) None of these.
9. A car is driving directly north on the freeway at a speed of 110 km/hour and a truck is leaving the freeway driving 85 km/hour in a direction that is 35° west of north. What is the magnitude of the velocity of the truck relative to the car?
- (1) 63 km/hr (2) 25 km/hr (3) 49 km/hr (4) 40 km/hr (5) None of these.
10. A stone is thrown horizontally from a 80 m tall tower with a speed of v_i . At what speed must the stone be thrown so that it stays in the air twice as long?
- (1) None of these. (2) $2v_i$ (3) $4v_i$ (4) $1.41v_i$ (5) $1.50v_i$
11. From the edge of the rooftop of a building, a boy throws a stone at an angle of 25° above the horizontal. The stone hits the ground 4.2 s later, 105 m away from the base of the building. Find the final speed of the stone.
- (1) 38.1 m/s (2) 27.6 m/s (3) 25 m/s (4) 29.5 m/s (5) None of these.
12. "In an interaction between two objects, each object exerts a force on the other. These forces are equal in magnitude and opposite in direction." This is our text's version of Newton's third law. In lecture, I demonstrated Newton's third law by pulling on a chair. According to Newton's third law, for the force I exerted on the chair, the chair exerted an equal and opposite force on me. The chair moved when I pulled on it. Why?
- (1) The force I exerted on the chair and the force the chair exerted on me act on different systems. The chair moved because the force I exerted was greater than the frictional force in the chair's wheels.
 (2) Newton's third law does not apply to such a simple system as a chair.
 (3) The normal force of the floor on the chair cancelled the chair's weight, making the chair easy to move.
 (4) Newton's second law is more important than Newton's third law and according to Newton's second law, the chair should move.
 (5) None of these.
13. A 100-kg boat is floating in the water. The propeller applies a 600 N force to the boat and the water resistance applies a 200 N force against the boat's motion. What is the acceleration of the boat?
- (1) 4 m/s^2 (2) 6 m/s^2 (3) 2 m/s^2 (4) 8 m/s^2 (5) None of these.
14. A block of mass $M = 3 \text{ kg}$ slides along the floor while an external force F_{ext} is applied at an upward angle $\theta = 35^\circ$. If the coefficient of kinetic friction between the block and the floor is 0.4, and the magnitude of the acceleration of the block is 1.0 m/s^2 , what is the magnitude of the external force?



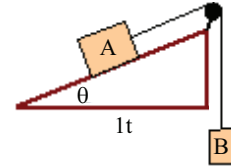
- (1) 14.1 N (2) 3.0 N (3) 11.8 N (4) 14.8 N (5) None of these.

15. A block of mass M is at rest on a plane inclined at angle θ to the horizontal. If the coefficient of static friction between the block and the surface is 0.7 and the coefficient of kinetic friction between the block and the surface is 0.4, what is the angle θ where the block slides at constant speed?



- (1) 21.8° (2) 35.0° (3) 30.0° (4) 16.7° (5) None of these.

16. The masses in the figure are equal and the angle $\theta = 37^\circ$. If the system is motionless, what is the minimum value of the coefficient of static friction?



- (1) 0.50
 (2) 1.00
 (3) 0.40
 (4) 0.75
 (5) None of these.

17. The Earth turns on its axis once in one day. What is the angular speed of the Earth?

- (1) 7.3×10^{-5} rad/s (2) 4.2×10^{-3} rad/s (3) 3.0×10^{-5} rad/s (4) 8.9×10^{-4} rad/s (5) None of these.

18. The Earth travels around the Sun once in one year. The distance from the Earth to the Sun is 1.50×10^{11} m. What is the mass of the Sun?

- (1) 2.0×10^{30} kg (2) 1.0×10^{30} kg (3) 3.0×10^{30} kg (4) 4.0×10^{30} kg (5) None of these.

19. A turntable starts from rest and rotates at a constant angular acceleration. At one time it is rotating at 4 rev/s. After 60 revolutions, its angular speed is 16 rev/s. Starting at $t = 0$, what is the time required to complete 68.2 revolutions?

- (1) 8 s (2) 16 s (3) 4 s (4) 32 s (5) None of these.

20. A spinning wheel has radius 0.30 m. A point on the rim is moving 0.5 m/s and the wheel's angular acceleration is 2.5 rad/s^2 . What is the net acceleration of the point on the rim?

- (1) 1.12 m/s^2 (2) 0.83 m/s^2 (3) 0.75 m/s^2 (4) 0.62 m/s^2 (5) None of these.