PHYSICS 111
EXAM 1
FALL 2002

Please fill in your computer answer sheet as follows:

1) In the NAME grid, fill in your last name, leave one blank space, then your first name.

2) Write your ID number in the IDENTIFICATION NUMBER section of the sheet.

3) Write your recitation section number in the spaces K,L in the SPECIAL CODES section. Single digits should be preceded by a 0 (e.g. section 1 is written as 01).

4) Fill in the circles on the sheet corresponding to the letters or numbers of your name, ID and section with a #2 pencil.

1. A student travels the 35 miles from Ames to Des Moines at an average speed of 65 miles per hour. What is the time for the trip?
   A. 25 min.   B. 32 min.   C. 39 min.
   D. 46 min.   E. 50 min.

2. A student travels 35 miles south to Des Moines and then 100 miles east to Iowa City for the big game. In Iowa City what is her displacement from Ames?
   A. 65 miles   B. 100 miles   C. 106 miles
   D. 118 miles   E. 135 miles

3. A plot of position verses time for a trip is shown on a graph to the right. At what point does the velocity have its greatest magnitude?
   A. B. C. D. E.
4. A car starting from rest travels 500 meters in 90 s. What is the acceleration (assumed constant)?
   - A. \(0.12 \text{ m/s}^2\)
   - B. \(0.25 \text{ m/s}^2\)
   - C. \(0.38 \text{ m/s}^2\)
   - D. \(0.45 \text{ m/s}^2\)
   - E. \(0.52 \text{ m/s}^2\)

A 2000 gram rock is thrown straight up at an initial speed of 16 m/s. Neglect the effects of air friction.

5. How high does the rock rise?
   - A. 8 m
   - B. 13 m
   - C. 18 m
   - D. 25 m
   - E. 32 m

6. At the highest point of the flight path which statement is true?
   - A. Both the velocity and acceleration are zero.
   - B. The velocity is zero and the acceleration is up.
   - C. The velocity is zero and the acceleration is down.
   - D. Both the velocity and acceleration are up.
   - E. The acceleration is down and the velocity is up.

7. An airliner traveling directly east from Chicago to New York at 250 m/s (still air) encounters a wind blowing from south to north at 60 m/s. In what direction must the pilot travel to reach New York?
   - A. 20° north of east
   - B. 14° north of east
   - C. east
   - D. 14° south of east
   - E. 20° south of east
A projectile is fired at an object in the plane below the cliff with an initial velocity of 300 m/s as shown to the right. Neglect air resistance.

8. How long is the projectile in the air?
   A. 2.9 s
   B. 3.8 s
   C. 4.3 s
   D. 5.8 s
   E. 6.7 s

9. How far from the base of the cliff does the projectile land?
   A. $4.3 \times 10^2$ m
   B. $6.5 \times 10^2$ m
   C. $8.3 \times 10^2$ m
   D. $1.06 \times 10^3$ m
   E. $1.29 \times 10^3$ m

10. A constant force of 20 N is exerted on a 50 kg box initially at rest on a frictionless floor as shown to the right. How far does the box move in 10 s?
    A. 12 m
    B. 14 m
    C. 16 m
    D. 18 m
    E. 20 m

11. A small satellite (~100 pounds) in orbit around the earth collides head-on with an asteroid weighing many tons.
    A. The force exerted by the satellite on the asteroid is greater than the force exerted by the asteroid on the satellite.
    B. The force exerted by the satellite on the asteroid is equal to the force exerted by the asteroid on the satellite.
    C. The force exerted by the satellite on the asteroid is less than the force exerted by the asteroid on the satellite.
    D. No forces are exerted during the collision.
    E.
A 50 kg box rests on a frictionless inclined plane, as shown to the right.

12. What is the acceleration of the box down the plane?

A. 2.5 m/s²
B. 2.8 m/s²
C. 3.4 m/s²
D. 4.0 m/s²
E. 4.9 m/s²

13. If the coefficient of friction between the box and plane in problem 12 is adjusted so that the box slides down the plane at a constant speed of 2.0 m/s, what is the total force on the box parallel to the plane?

A. 0 N
B. 18 N
C. 26 N
D. 34 N
E. 48 N

14. A 10 kg mass is suspended by ropes as shown to the right. What is the tension T?
Hint: Neglect mass of the ropes.

A. 41 N
B. 55 N
C. 73 N
D. 98 N
E. 106 N

15. A 80 kg block resting on a table is connected by a massless cord to a 30 kg block as shown to the right. If the coefficient of kinetic friction between table and block is 0.25, what is the acceleration of the 30 kg block?
Hint: This problem is longer than the others.

A. 0.89 m/s²
B. 1.21 m/s²
C. 2.45 m/s²
D. 3.21 m/s²
E. 4.32 m/s²
16. A car with a mass of 1200 kg moves around a circular track as shown to the right with a constant speed of 20 m/s. What is the centripetal force needed to keep the car on the track?

A. $1.0 \times 10^3$ N  
B. $1.5 \times 10^3$ N  
C. $2.4 \times 10^3$ N  
D. $3.8 \times 10^3$ N  
E. $4.6 \times 10^3$ N

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A 1200 kg car is traveling at a speed of 25 m/s on a straight level road. The driver turns off the engine and the car travels 100 m before stopping.

17. What is the magnitude of the work done on the car to stop it?

A. $1.86 \times 10^5$ J  
B. $2.50 \times 10^5$ J  
C. $3.00 \times 10^5$ J  
D. $3.75 \times 10^5$ J  
E. $4.50 \times 10^5$ J

18. What is the magnitude of the average power needed to stop the car if it coasts for 20 s?

A. $1.88 \times 10^4$ W  
B. $2.36 \times 10^4$ W  
C. $3.85 \times 10^4$ W  
D. $4.36 \times 10^4$ W  
E. $4.89 \times 10^4$ W