PHYSICS 111  
EXAM 1  
FALL 2003

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 from his home in Minnesota to reach Ames traveling on interstate 35. He averages 70 miles per hour and it takes him 3 hours and 45 minutes to reach Ames. How far is his home from Ames?
   A. 125 miles  B. 163 miles  C. 207 miles  D. 231 miles  E. 262 miles

2. Later in the course you will use a formula \( F = Y \frac{\Delta L}{L} \) A that describes the stretching \( \Delta L \) of an object of length L and cross sectional area A under a force F. \( Y \) is a constant of the material called Young's Modulus. What are the dimensions of \( Y \)?
   A. MTT/L  B. MTTL  C. MLL/T  D. TTL/M  E. MTT/LL

3. A plot of position verses time for a trip is shown on a graph to the right. At what points are the velocities zero?
   A. A,C  B. A,D  C. B,C  D. B,D  E. B,E

4. A car moves from point A to point B along a circular track as shown in the figure to the right. At point B what is the distance traveled by the car and what is the car's displacement?
   Hint: Circumference of circle = \( 2\pi r \)
   A. 1.00 km, 1.00 km  B. 1.00 km, -1.00 km  C. 1.57 km, 1.00 km  D. 1.57 km, -1.00 km  E. 2.00 km, 1.00 km
5. A car is moving down a straight level highway at 20 m/s. The driver wishes to increase his velocity to 30 m/s. If he accelerates at a rate of 3.0 m/s², how far must he travel to reach a speed of 30 m/s?

A. 51 m  B. 74 m  C. 83 m  D. 95 m  E. 110 m

6. A girl drops a 1.0 kg rock over the edge of a cliff 50 m high. How fast is the rock moving when it hits the bottom of the cliff? Neglect the effects of air friction.

A. 28 m/s  B. 31 m/s  C. 38 m/s  D. 45 m/s  E. 52 m/s

7. In a lecture demonstration a small ball was shot horizontally from a spring gun an simultaneously an identical ball was dropped. Which statement below best describes the result of the demonstration?

A. The ball that was shot from the gun landed first.
B. The ball that was dropped landed first.
C. Both balls landed at about the same time.

8. The pilot of a boat starting from point A, points her boat at an angle of 30 degrees to the direction of the flow of a river as shown to the right. The speed of flow of the river is 4.0 m/s. What must be the speed of her boat with respect to the river if she is to arrive at the opposite shore at point B, directly across the river from her starting point?

A. 3.9 m/s  B. 4.6 m/s  C. 5.8 m/s
D. 6.7 m/s  E. 8.0 m/s

9. A bullet is fired horizontally from a handgun at a target 20 m away. If the initial velocity of the bullet as it leaves the gun is 100 m/s, how much will the bullet have dropped by the time it hits the target? Neglect effects due to friction.

A. 0.16 m  B. 0.20 m  C. 0.26 m  D. 0.31 m  E. 0.35 m

10. An artillery shell is fired on a level plain at an angle of 30 degrees with respect to the horizontal with a muzzle velocity of 50 m/s. Neglecting friction effects how long is the shell in the air?

A. 5.1 s  B. 5.9 s  C. 6.5 s  D. 7.2 s  E. 8.3 s

11. The engine of a 2000 kg car with an initial speed of 25.0 m/s stops and the car rolls a distance 400 m before coming to an stop. If the road is horizontal and straight, what is the constant force of friction acting on the car?

A. 1170 N  B. 1210 N  C. 1320 N  D. 1480 N  E. 1560 N
12. A small car collides head on with a train that is stopped at a railroad crossing. Which statement best describes the forces involved?

A. The force of the car on the train is greater than the force of the train on the car.
B. The force of the train on the car is greater than the force of the car on the train.
C. The force of the car on the train is equal to the force of the train on the car.
D. The force of the train on the car is zero since the train is not moving.

13. A car of mass 2000 kg is pulling a boat whose mass is 1500 kg. The car's engine exerts a force of 100 N on the car. What is the force that the car exerts on the boat? Neglect the effects of friction.

A. 32 N  B. 43 N  C. 65 N  D. 75 N  E. 100 N

14. A 100 kg crate is sliding down a ramp at a CONSTANT SPEED of 0.5 m/s. The ramp is inclined at an angle of 30 degrees with respect to the horizontal. What is the coefficient of kinetic friction for the crate on the ramp?

A. 0.25  B. 0.38  C. 0.44  D. 0.58  E. 0.65

15. A mass is suspended by ropes as shown to the right. The tension in the rope on the left is 245 N and the tension in the rope on the right is 200 N. What is the mass of the suspended object? Neglect mass of the ropes.

A. 28 kg  B. 33 kg  C. 40 kg  D. 45 kg  E. 52 kg

16. A car is traveling around a circular track at a constant speed. What supplies the centripetal force needed to keep the car moving in a circle?

A. The weight of the car.
B. The normal force of the road acting on the car.
C. The force of friction between tires and road acting on the road.
D. The force of friction between tires and road acting on the car.

17. A man drags a 30.0 kg box which is initially at rest across a level floor as shown to the right. He exerts a force of 40.0 N on the rope. Neglecting the effect of friction what is the total work done by the man on the box after he has dragged it 20.0 m?


18. In problem 17 what is the speed of the box after the man has dragged it the 20.0 m given above?

A. 3.2 m/s  B. 4.6 m/s  C. 5.5 m/s  D. 6.1 m/s  E. 6.8 m/s