Physics 201 MWF9:10 Fall 2008 (Ford)

Name (printed)______________________________

Name (signature as on ID)______________________________

Lab Section Number________________

Exam 2 Chapts. 6-8 in Young&Geller

Multiple Choice questions. Circle the correct answer. No work needs to be shown.

(6 pts) 1. A small rock with mass $m = 0.20$ kg swings back and forth on the end of a 2.0 m long string. As the rock passes through its lowest point, with the string vertical, the tension in the string is $T = 3.92$ N. At this point the speed of the rock is

\[ \begin{align*} 
(a) & \quad 4.43 \text{ m/s} \\
(b) & \quad 6.26 \text{ m/s} \\
(c) & \quad 7.67 \text{ m/s} \\
(d) & \quad 8.85 \text{ m/s} \\
(e) & \quad 10.8 \text{ m/s} \\
(f) & \quad \text{none of the above values} 
\end{align*} \]

(5 pts) 2. A block slides up an incline from point $A$ at the bottom to point $B$ at the top of the incline. During the motion from point $A$ to point $B$, the work done by the gravity force on the rock is

\[ \begin{align*} 
(c) & \quad \text{negative} \\
(b) & \quad \text{positive} \\
(a) & \quad \text{zero} 
\end{align*} \]

(5 pts) 3. In question 2, the work done by the normal force on the rock is

\[ \begin{align*} 
(a) & \quad \text{zero} \\
(b) & \quad \text{positive} \\
(c) & \quad \text{negative} 
\end{align*} \]
(5 pts) 4. At point \( A \) an object has speed 8 m/s. At point \( B \) it has speed 12 m/s. During the motion from \( A \) to \( B \) the total work done on the object is

(a) zero  
(b) positive  
(c) negative

(5 pts) 5. On a horizontal frictionless surface a 5 kg block moving at 8 m/s collides with a 55 kg block that is initially at rest. Which of the following statements is correct:

(a) the magnitude of the change in momentum for the 5 kg block is less than the magnitude of the change in momentum for the 55 kg block.  
(b) the magnitude of the change in momentum for the 5 kg block is the same as the magnitude of the change in momentum for the 55 kg block.  
(c) the magnitude of the change in momentum for the 5 kg block is greater than the magnitude of the change in momentum for the 55 kg block.

(6 pts) 6. A 98 kg block is at rest on a horizontal frictionless surface and is attached to one end of a horizontal spring. The other end of the spring is attached to the wall. A 2 kg block traveling horizontally at 10 m/s strikes the 98 kg block and sticks to it. After the collision the maximum elastic potential energy stored in the spring is

(a) 5000 J  
(b) 0.20 J  
(c) 2.0 J  
(d) 49 J  
(e) 100 J  
(f) none of the above answers
On the following problems show all your work. Partial credit will be given if earned. Write your answers in the blanks provided.

(18 pts) 7. A small rock attached to one end of a 5.0 m long string swings in a horizontal circle at constant speed. The angle between the string and the vertical direction is $37^\circ$ and is constant. The tension in the string is $T = 40 \text{ N}$.

(a) What is the mass of the rock?

Ans. $3.26 \text{ kg}$

(b) How much time does it take the rock to complete one complete revolution?

Ans. $4.05$
(18 pts) 8. On Planet X you throw an object straight up with a speed of 8 m/s and find that it reaches a maximum height of 48 m above the point from which it was thrown. The mass of Planet X is $6.0 \times 10^{24}$ kg. What is the radius of Planet X?

Ans. $2.45 \times 10^7$ m
A block with mass 2.0 kg is released from rest at point A on a metal track and slides to point B, as shown on the sketch. At point B the block has speed \( v_B = 5.0 \text{ m/s} \). Point A is 8.0 m above the ground and point B is 2.0 m above the ground. How much work is done on the block by friction as the block moves from point A to point B? (You must indicate whether your answer is positive or negative.)

\[
\text{Ans. } -92.6 \text{ J}
\]
(16 pts) 10. On a horizontal frictionless surface, block A (mass 2.0 kg) is sliding toward the east with speed $v_{A1}$ and block B (mass 4.0 kg) is sliding north at speed $v_{B1}$. The blocks collide and stick together. After the collision, the combined object is moving at 37° north of east at $v_f = 6.0$ m/s.

(a) What is the initial speed $v_{A1}$ of block A?

Ans. $14.4$ m/s

(b) What is the initial speed $v_{B1}$ of block B?

Ans. $5.4$ m/s