Exam 2 Chapters 6-8 in Young 10e

Multiple choice questions. Circle the correct answer. No work needs to be shown and no partial credit will be given.

(7 pts) 1. Blocks A and B are moving on a horizontal frictionless air track. Block A has mass 3.0 kg and block B has mass 6.0 kg. Initially block A is moving to the right at 6.0 m/s and block B is moving to the left at 8.0 m/s. The blocks collide and after the collision block A is moving to the left at 4.0 m/s. What is the velocity of block B after the collision?

(a) 3.0 m/s to the left
(b) 3.0 m/s to the right
(c) 8.6 m/s to the left
(d) 8.6 m/s to the right
(e) 13.0 m/s to the left
(f) 13.0 m/s to the right
(g) none of the above answers

(6 pts) 2. A block with mass 5.0 kg slides a distance of 6.0 m from point A at the top of a ramp to point B at the bottom of the ramp. The ramp is inclined at 53° above the horizontal. For the displacement of the block from A to B the work done on the block by gravity is

(a) 177 J
(b) −177 J
(c) 235 J
(d) −235 J
(e) 294 J
(f) −294 J
(g) zero
(h) none of the above answers

(6 pts) 3. A small block is sliding on the inside of a circular track that has radius \( R = 2.0 \) m. Point A is at the top of the block’s path. What is the minimum speed \( v \) that the block must have at point A so the block continues in its circular path and doesn’t fall from the track at point A.

(a) 3.1 m/s
(b) 4.4 m/s
(c) 5.4 m/s
(d) 6.3 m/s
(e) 19.6 m/s
(f) none of the above answers
(7 pts) 4. One end of a 2.00 m long rope is tied to the ceiling. A small rock is tied to the other end of the rope. The rock is released from rest with the rope horizontal. As the rock is swinging through its lowest point, where the rope is vertical, the tension in the rope is $T = 14.7$ N. What is the mass of the rock?

(a) 0.50 kg  
(b) 0.75 kg  
(c) 1.50 kg  
(d) 2.25 kg  
(e) 4.50 kg  
(f) none of the above answers

On the following problems you must show clearly how your answers are obtained to receive credit. Partial credit will be given, if earned. Write your answers in the blanks provided. All answers must include the correct plus or minus sign (if appropriate) and the correct units.

(18 pts) 5. A box of mass 3.0 kg is placed against a compressed spring. The spring is released and the box slides along a horizontal surface. The spring initially had 76.0 J of potential energy stored in it and after the box leaves the spring then there is no energy stored in the spring. After the box has traveled a distance of 2.0 m from its initial position its speed is 6.0 m/s. What is the coefficient of kinetic friction $\mu_k$ between the box and the surface?

Ans. $0.374$
(18 pts) 6. On a horizontal frictionless surface block A (mass 4.0 kg) is sliding toward the east with a speed of 6.0 m/s and block B (mass 8.0 kg) is sliding toward the north with a speed of 9.0 m/s. The blocks collide. Immediately after the collision block A is sliding toward the north with speed 7.0 m/s and block B is sliding with a speed of \( v_{Br} \) at an angle \( \theta \) north of east, as shown in the sketch. Calculate the speed \( v_{Br} \) and the angle \( \theta \).

\[
\begin{align*}
\text{before} & \\
\text{A} & \quad 6 \text{ m/s} \\
\uparrow & \\
\text{B} & \quad 9 \text{ m/s}
\end{align*}
\]

\[
\begin{align*}
\text{after} & \\
\text{A} & \quad 7 \text{ m/s} \\
\uparrow & \\
\text{B} & \quad v_{Br} \text{ at } \theta \text{ north of east}
\end{align*}
\]

Ans. \( v_{Br} \quad 6.26 \text{ m/s} \)
Ans. \( \theta \quad 61.4^\circ \)
(18 pts) 7. A 3.0 kg block moving at 12.0 m/s along a horizontal frictionless surface collides with a 2.0 kg block that is initially at rest. After the collision the two blocks stick together and then slide up a 53° frictionless inclined plane, as shown in the sketch. Calculate the maximum distance \( L \) that the two blocks travel up the incline.

\[ \text{Ans. } 3.31 \, \text{m} \]
(20 pts) 8. You are a member of a group of scientists who travel to planet Bubba, a planet that orbits a bright star in our southern sky. The radius of the planet is $R_p = 5.0 \times 10^6$ m.

a) You land on the planet. While you are standing on the surface of the planet you throw a small rock straight up with an initial speed of 6.0 m/s. The rock reaches a maximum height of 12.0 m above the point from which it was thrown. What is the mass of planet Bubba?

$$\text{Ans. } 5.62 \times 10^{-23} \text{ kg}$$

b) A satellite is in a circular orbit around planet Bubba. In its orbit the satellite is a distance of $9.00 \times 10^6$ m above the surface of the planet. What is the speed of the satellite?

$$\text{Ans. } 640 \text{ m/s}$$