Exam 1 Chapters 1-5 in Young 9e

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

(6 pts) 1. Block A is projected with a horizontal velocity of 4.0 m/s from the edge of a table that is 0.800 m above the floor. At the same instant when block A leaves the table, block B is released from rest at a height of 0.800 m above the floor. Neglect air resistance. Which of the following is correct:

(a) Block A reaches the floor before block B
(b) Block B reaches the floor before block A
(c) The two blocks reach the floor at the same time

(6 pts) 2. An elevator is moving downward while it is slowing down. The direction of its acceleration is

(a) upward
(b) downward
(c) the acceleration is zero

(6 pts) 3. A small rock is thrown from ground level with an initial velocity that has magnitude 15.0 m/s and direction 53.0° above the horizontal. Neglect air resistance. When the rock is at its maximum height above the ground, its speed is

(a) 9.0 m/s
(b) 12.0 m/s
(c) 16.0 m/s
(d) 20.0 m/s
(e) none of the above answers

(6 pts) 4. A small car travels at a constant speed of 6.00 m/s clockwise around a circular track. Points A and B and x and y coordinates are shown in the sketch. If it takes the car 3.00 s to travel from A to B, what is the y-component of the average acceleration of the car for its motion from A to B?

(a) zero
(b) +4.00 m/s²
(c) −4.00 m/s²
(d) +2.00 m/s²
(e) −2.00 m/s²
(f) none of the above answers
(6 pts) 5. A river flows due east with a speed of 3.0 m/s. A boat travels due north across the river from point A to point B. The speed of the boat relative to the water is 6.0 m/s. What is the speed of the boat relative to the earth?

(a) 3.00 m/s  
(b) 5.20 m/s  
(c) 6.71 m/s  
(d) 9.00 m/s  
(e) zero  
(f) none of the above answers

(6 pts) 6. A 10 kg block is at rest on a horizontal floor. The coefficient of static friction between the block and the floor is $\mu_s = 0.40$. If you apply a force to the block that has magnitude $F = 25.0$ N and direction $36.9^\circ$ below the horizontal, what is the magnitude of the friction force on the box?

(a) 45.2 N  
(b) 39.2 N  
(c) 33.3 N  
(d) 25.0 N  
(e) 20.0 N  
(f) zero  
(g) none of the above

On the following problems show all your work. 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.

(14 pts) 7. Mary is standing next to a tree in a large open field. She walks 16.0 m due east ($\vec{A}$) and then 12.0 m in a direction $36.9^\circ$ west of north ($\vec{B}$). After these two displacements, how far is she from the tree?

Ans. 13.0 m
(14 pts) 8. A small rock is thrown straight up from the edge of the roof of a building with an initial speed of $v_0$. The rock reaches the ground 3.00 s after being thrown and has speed 20.0 m/s just before it strikes the ground. Neglect air resistance.

(a) What was the initial speed $v_0$ of the rock?  
Ans. 9.4 m/s

(b) What is the height of the building?  
Ans. 15.9 m

(18 pts) 9. A small rock is projected from the ground with velocity with magnitude $v_0$ and direction 53.1° above the horizontal. A tall building is a horizontal distance of 26.0 m from where the rock was launched. The rock strikes the building 2.00 s after being launched. Neglect air resistance and assume the ground is level. At what vertical height above the ground does the rock strike the building?

Ans. 15.0 m
(18 pts) 10. A 5.00 kg block is pulled up an incline that is inclined at 36.9° above the horizontal by a horizontal force $F = 90.0$ N. The coefficient of kinetic friction between the block and the surface of the incline is $\mu_k = 0.20$.

(a) What is the magnitude of the friction force on the block?  

Ans. $18.6\ N$

(b) If the block starts from rest at the bottom of the incline, how long does it take the block to travel 14.0 m to the top of the incline?  

Ans. $2.42\ s$