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

(5 pts) 1. A small light car collides head-on with a large heavy truck. Which of the following statements is correct about what happens as a result of the collision?

(a) Both vehicles have the same magnitude of change of momentum.
(b) The magnitude of the momentum change for the car is larger than the magnitude of the momentum change for the truck.
(c) The magnitude of the momentum change for the car is smaller than the magnitude of the momentum change for the truck.

(5 pts) 2. One end of a 6.00 m long rope is tied to the ceiling. A small rock with mass 0.500 kg is tied to the other end of the rope. The rock is released from rest at point $A$, where the rope makes an angle of 53° with the vertical. Point $B$ is where the rock is at its lowest point and the rope is vertical. As the rock swings on the end of the rope from $A$ to $B$, the work done on the rock by the tension force is

(a) zero
(b) +11.7 J
(c) −11.7 J
(d) +29.4 J
(e) −29.4 J
(f) none of the above answers

(6 pts) 3. One end of a 6.00 m long rope is tied to the ceiling. A small rock with mass 0.500 kg is tied to the other end of the rope. The rock is released from rest with the rope horizontal. What is the tension in the rope when the rock is swinging through its lowest point, where the rope is vertical?

(a) zero
(b) 4.9 N
(c) 9.8 N
(d) 14.7 N
(e) 19.6 N
(f) none of the above answers
(6 pts) 4. A small block with mass 0.500 kg slides on the inside of a circular track that has radius 0.600 m. When the block is at the highest point of its path (point A), its speed is 3.00 m/s. What is the downward normal force that the track exerts on the block when it is at point A during its motion?

(a) 10.4 N  
(b) 15.0 N  
(c) 19.6 N  
(d) 30.0 N  
(e) 49.6 N  
(f) none of the above answers

(5 pts) 5. A ramp is inclined at 36.9° above the horizontal. A block with mass 0.500 kg is pulled up the ramp by a force \( F \). The block starts at point A at the bottom of the ramp and ends up at point B at the top of the ramp. The distance from A to B, measured along the ramp is 5.00 m. The work done on the block by gravity as the block moves from point A to point B is

(a) +24.5 J  
(b) −24.5 J  
(c) +19.6 J  
(d) −19.6 J  
(e) +14.7 J  
(f) −14.7 J  
(g) none of the above answers

(6 pts) 6. Blocks A and B are moving on a horizontal frictionless air track. Block A has mass 4.00 kg and block B has mass 2.00 kg. Initially block A is moving to the right at 6.00 m/s and block B is moving to the left at 9.00 m/s. The blocks collide and after the collision block A is moving to the left at 2.00 m/s. What is the velocity of block B after the collision?

(a) 1.00 m/s to the left  
(b) 1.00 m/s to the right  
(c) 7.00 m/s to the left  
(d) 7.00 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
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.

(16 pts) 7. On a horizontal frictionless surface block A (mass 3.00 kg) is sliding toward the east with speed $v_A$ and block B (mass 5.00 kg) is sliding toward the north with speed $v_B$. After the collision block B is sliding toward the north with speed 2.00 m/s and block A is sliding with a speed of 6.00 m/s in a direction of $30.0^\circ$ north of east, as shown in the sketch. What are the speeds $v_A$ and $v_B$ of the two blocks before the collision?

[Diagram showing initial and final velocities of blocks A and B]
(17 pts) 8. A box of mass 2.00 kg is placed against a compressed spring. The spring is released and the box slides along a horizontal surface. The spring initially had 82.0 J of potential energy stored in it. The coefficient of kinetic friction between the box and the surface is $\mu_k = 0.400$. What is the speed of the box after it has traveled a distance of 3.00 m from its initial position? (At this point the box is no longer in contact with the spring and no potential energy is left in the spring.)

Ans. _________
9. A bullet with mass $6.00 \times 10^{-3}$ kg is fired horizontally with speed $v_0$ into a 1.20 kg wood block that is initially at rest on a horizontal frictionless surface. The coefficient of kinetic friction between the block and the surface is 0.200. The bullet remains embedded in the block and after the collision with the bullet the block slides 0.120 m before coming to rest. What was the initial speed $v_0$ of the bullet?

Ans. __________
(17 pts) 10.
a) Your spaceship is in a circular orbit around planet X. The radius of the orbit is $9.00 \times 10^6$ m and the speed of the spaceship in its orbit is 2800 m/s. The radius of the planet is $4.00 \times 10^6$ m. What is the mass of planet X?

Ans. ________________

b) You land on the surface of planet X. You exit from your spaceship in order to do some physics experiments. You release a small rock from rest at a height of 24.0 m above the surface of the planet. How long after it is released does the rock reach the surface?

Ans. ________________