Quest Chapter 07a

#	Problem	Hint
1	A lunar vehicle is tested on Earth at a speed of 10 km/h. When it travels this fast on the moon, how does its momentum compare to the momentum on Earth? 1. the same as on Earth 2. less than on Earth 3. None of these 4. greater than on Earth	Assume the speed is the same on the moon as on the Earth. What is the definition of momentum? $\rho = mv$ Do these change on the moon?
2	(part 1 of 4) Calculate the momentum for a 0.1 kg rifle bullet traveling 300 m/s.	Substitute and solve. $\rho = mv$
3	(part 2 of 4) What momentum does a 1100 kg automobile traveling 0.3 m/s (a few miles per hour) have?	Substitute and solve.
4	(part 3 of 4) What momentum does a 40 kg person running 9 m/s (a fast sprint) have?	Substitute and solve.
5	(part 4 of 4) What momentum does a 14000 kg truck traveling 0.03 m/s (a slow roll) have?	Substitute and solve.
6	Which of the following undergoes the greatest change in momentum if the baseballs have the same speed just before being caught and just before being thrown? 1. A baseball that is thrown 2. A baseball that is caught 3. A baseball that is caught and then thrown back	Consider each part: throw, catch, throw. What changes in the last situation: Caught then Thrown? How do the momenta compare for each part?
7	If a 0.144 kg baseball has a momentum of 6.17 kg·m/s as it is thrown from home to second base, what is its velocity?	Substitute and solve. $\rho = mv$

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8	If you throw a raw egg against a wall, you'll break it, but if you throw it with the same speed into a sagging sheet it won't break. Why? 1. The sheet is much slicker than the wall. 2. The impact time when the egg strikes a sagging sheet is long, so the impact force is small. 3. The breaking egg causes a larger impact time, decreasing the force. 4. The velocity of the egg decreases faster in the sheet than on the wall.	Use the impulse equation when considering this question. Impulse = Ft Which variable remains the same in both examples? Which variable increases in the sheet example? Which variable decreases because of that?
9	What is the impulse needed to stop a 10 kg bowling ball moving at 6 m/s?	Remember: Impulse = Ft, but also Impulse = Δ(mv).
10	(part 1 of 3) A 15000 kg tank moving at 10 m/s is brought to a halt in 0.5 s by a reinforced-steel tank barrier. What impulse was imparted to the tank? Answer in units of kgm/s	Remember: Ft = Impulse And, Impulse = Δ(mv) So, Ft = Δ(mv)
11	(part 2 of 3) What is the average net force exerted by the tank on the barrier? Answer in units of N	Use the impulse equation when considering this question.
12	(part 3 of 3) What is more important in determining the amount of damage an object sustains in a collision? 1. Both of these 2. None of these 3. the total momentum change 4. the total momentum change per unit time	Total momentum change equals Δ(mv) which is impulse. And, Ft=Δ(mv). So, what do you have when you divide by time? So, you choices are between Δ(mv) and what?

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13	How does impulse differ from force? 1. Force produces momentum; impulse produces acceleration. 2. Momentum is larger than force. 3. Force is usually larger than momentum. 4. None of these 5. Force produces acceleration; impulse produces momentum. 6. Force produces acceleration; impulse produces change in momentum.	Consider the Second Law of Motion and the impulse equation. You are comparing the effect the two things have. This effect is seen on the other side of the equal sign.
14	Why might a wine glass survive a fall onto a carpeted floor but not onto a concrete floor? 1. The decrease of momentum of the wine glass in the carpet is more than that in the concrete. 2. The decrease of velocity of the wine glass in the carpet is less than that in the concrete. 3. Since the carpet is softer than the concrete and the force of impact is reduced by the extended time of impact. 4. None of these 5. The decrease of momentum of the wine glass in the carpet is less than that in the concrete. 6. The decrease of velocity of the wine in the carpet is more than that in the concrete.	Consider the impulse equation for this problem. What is the difference in the two situations? How does that affect the glass?
15	A 0.54 kg football is thrown with a velocity of 18 m/s to the right. A stationary receiver catches the ball and brings it to rest in 0.019s. What is the force exerted on the receiver?	Use the impulse equation: $Ft=\Delta(mv)$.
16	A football punter accelerates a 0.57 kg football from rest to a speed of 8.3 m/s in 0.19s. What constant force does the punter exert on the ball?	Use the impulse equation.

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17	A 62.3 kg astronaut is on a space walk when the tether line to the shuttle breaks. The astronaut is able to throw a 12.0 kg oxygen tank in a direction away from the shuttle with a speed of 13.0 m/s, propelling the astronaut back to the shuttle. Assuming that the astronaut starts from rest, find the final speed of the astronaut after throwing the tank.	What is the momentum of the tank and the astronaut before the tank is thrown? What is the momentum of the tank after it is thrown? Use the Law of Conservation of Momentum to find the momentum of the astronaut. Now, use the definition of momentum to find the speed of the astronaut.
18	Two blocks of masses M and 3M are placed on a horizontal, frictionless surface. A light spring is attached to one of them, and the blocks are pushed together with the spring between them. A cord holding them together is burned, after which the block of mass 3M moves to the right with a speed of 2.2 m/s. What is the speed of the block of mass M?	Could you that through the spring each block pushes on the other? (Third Law of Motion) So, the forces on each block are what? Is the impulse time the same for both blocks? Remember that momentum is conserved.

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19	Railroad car A rolls at a certain speed and makes a perfectly elastic collision with car B of the same mass. After the collision, car A is observed to be at rest. How does the speed of car B compare with the initial speed of car A? 1. The speed of car B is more than the initial speed of car A. 2. The speed of car B is less than the initial speed of car A. 3. None of these. 4. The speed of car B is the same as the initial speed of car A.	Remember that momentum is conserved. But, what do we know about the initial velocity of car B?
20	Suppose the entire population of the world gathers in one spot and, at the sounding of a prearranged signal, everyone jumps up. While all the people jump up, does the Earth gain momentum in the opposite direction? 1. Yes, the Earth recoils, like a rifle firing a bullet, with a change in momentum equal to and opposite that of the people. 2. It depends. 3. No. 4. Yes; because of its much larger inertial mass, however, the change in momentum of Earth ismuch less than that of all the jumping people.	Do the jumpers experience a change of momentum? Remember that momentum is conserved.
21	A person attempts to knock down a large wooden bowling pin by throwing a ball at it. The person has two balls of equal size and mass, one made of rubber and the other of putty. The rubber ball bounces back, while the ball of putty sticks to the pin. Which ball is most likely to topple the bowling pin? 1. the rubber ball 2. need more information 3. makes no difference 4. the putty ball	Remember that momentum is conserved. What is the change in momentum of the putty compared to the rubber ball? Whichever has the greatest change in momentum would be the best one to topple the pin.

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22	(part 1 of 4) A 33 kg gun is standing on a frictionless surface. The gun fires a 54.9 g bullet with a muzzle velocity of 310 m/s. The positive direction is that of the bullet. Calculate the momentum of the bullet immediately after the gun was fired. Answer in units of kg · m/s	What equation defines momentum? $\rho = mv$ Remember: Convert mass from g to kg.
23	(part 2 of 4) Calculate the momentum of the gun immediately after the gun was fired. Answer in units of kg · m/s	Momentum is con…served. So, what about the direction?
24	(part 3 of 4) Calculate the kinetic energy of the bullet immediately after the gun was fired. Answer in units of J	What equation defines kinetic energy? $E_k = ½ mv^2$
25	(part 4 of 4) Calculate the kinetic energy of the gun immediately after the gun was fired. Answer in units of J	Use the conservation of momentum to find the velocity of the gun. Then, use the equation in #24 to find the kinetic energy.
26	A(n) 19.8 g bullet is shot into a(n) 5236 g wooden block standing on a frictionless surface. The block, with the bullet in it, acquires a velocity of 1.93 m/s. Calculate the velocity of the bullet before striking the block. Answer in units of m/s	"The block with the bullet in it" means what about the mass? What does the "frictionless" surface mean in the problem? What is conserved in the collision of the bullet and the block-bullet? Remember: $\rho_{before} = \rho_{after}$

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27	Where is the fluid pressure the greatest? 1. 2 meters below the surface of a swimming pool. 2. 30 centimeters below the surface of a swimming pool. 3. 1 meter below the surface of a swimming pool. 4. The pressure is the same in all parts of a swimming pool.	Review your notes or the text about fluid pressure. How does it change with depth?
28	(part 1 of 2) The force of friction acting on a sliding crate is 155 N. How much force must be applied to maintain a constant velocity? Answer in units of N	“Sliding” means dynamic (or kinetic) friction. Constant Velocity means what about the forces?
29	(part 2 of 2) What will be the net force acting on the crate? Answer in units of N	Constant Velocity means what about the forces?
30	A book rests on the shelf of a bookcase. The reaction force to the force of gravity acting on the book is 1. The force exerted by the book on the earth. 2. None of these. 3. The force of the shelf holding the book up. 4. The weight of the book. 5. The frictional force between book and shelf.	Newton’s Third Law of Motion