

Physics 200B  
Lab 9 homework

Name: \_\_\_\_\_

1. A car of mass 1500 kg moving at 25.0 m/s on an icy road collides with a truck of mass 4500 kg at rest. Their bumpers lock together during the collision.

a) What is their speed immediately after the collision?

b) Compare the magnitude of the force exerted *by the car on the truck* with that exerted *by the truck on the car* during the collision. Is one force larger than the other or are they equal in magnitude to each other? Explain your reasoning.

c) Explain briefly why the change in the car's velocity is greater than the change in the truck's velocity, given your answer to b).

2. A tow truck driver refuses to tow a car out of a ditch, saying that it's physically impossible to move the car. The driver's reasoning is that even if the truck exerts a forward force on the car, the car will exert a backwards force on the truck and the truck will be unable to move. Do you agree with the driver? Explain. (Hint: is the force of the car on the truck the only force acting on the truck?)

3. A superball of mass 0.050 kg is dropped from a height of 50 cm above a table top. It bounces off the table and rises to the same height as it was dropped from.

a) Calculate the impulse exerted on the ball while it is in contact with the table. (**Hint:** First calculate the velocity just before and after hitting the table.)

b) If the superball was in contact with the table for 30 ms, calculate the average force exerted on the ball by the table during this time.

c) Compare the force you found in b) to the gravitational force on the ball (its weight). Is it reasonable to ignore the gravitational force during the time of the collision? Explain briefly.

d) The superball is now replaced by a clay ball of the same size and mass. The ball is dropped from the same height and it sticks to the table. Calculate the impulse exerted on the clay ball and compare it to that with the superball. Which is larger, or are they both the same? Explain.

e) If the collision of the clay ball with the table takes the same 30 ms as the collision of the superball, calculate the average force exerted by the table on the clay ball and compare it to that exerted on the superball. Which is larger, or are they the same? Explain.

4. This problem is on WebAssign under Lab 9 homework.