Multiple choice. Indicate the best answer.

1. Which of the following statements is true of an explosion?
   1. Since objects begin at rest and then are moving, momentum is created
   2. After an explosion, the heavier object is moving quicker than the lighter object
   3. After the explosion, the total momentum is zero
   4. Kinetic energy is conserved in an explosion
2. When a bullet is shot out of a gun, which experiences the greater change in momentum
   1. The bullet
   2. The gun
   3. It depends on the speed of the bullet
   4. They experience the same change in momentum
3. When a bullet is shot from a gun, the recoil speed is small compared to the speed of the bullet. This is because
   1. The bullet receives a larger impulse than the gun
   2. The gun is shooting the bullet so the bullet feels most of the force
   3. The gun has a much greater mass than the bullet
   4. The time that the force is acting on the bullet is greater than the time the force is acting on the gun.
4. Two students sit facing each other in chairs with wheels. One student is heavier than the other. As the one student pushes off the other student, which student will travel at a greater speed?
   1. The lighter student
   2. The heavier student
   3. They travel at the same speed
   4. It depends on which student does the pushing

**Long Answer. Answer the following questions, showing all work.**

1. A 65 kg man standing on a 130 kg boat jumps off the boat towards the dock at a speed of 2 m/s. What is the resulting speed of the boat?
2. A 100 kg cannon is sitting on a frictionless surface as it fires a cannonball horizontally at 40 m/s. If the cannon’s recoils backwards at a speed of 2 m/s, what was the mass of the cannonball?
3. Two carts are sitting on a frictionless track with a compressed spring between them. The sum of the masses of carts A and B is 1.5 kg. After the spring releases, Cart B has twice the speed of Cart A. What is the mass of each cart?