In Motion Review #2

(Newton's Laws of Motion, Stopping and Braking Distance)

Part A – Multiple Choice

1. C
2. D
3. B
4. B
5. B
6. D
7. C
8. C
9. D

Part B – Free Response Questions

1. Your shopping cart has a mass of 65 kilograms. To accelerate the shopping cart down an aisle at 0.3 m/s^2, what force would you need to use or apply to the cart?

$$F = ma$$
$$F = (65)(0.3)$$
$$195\ N$$

2. A small child has a wagon with a mass of 10 kilograms. The child pulls on the wagon with a force of 2 N. What is the acceleration of the wagon?

$$F = ma$$
$$2 = (10)a$$
$$a = 0.2\ m/s^2$$

3. Which of Newton's laws best explains why motorists should buckle-up?

Newton's first law. Objects at rest will stay and rest and objects in motion will stay in motion in a straight line unless acted on by an external unbalanced force.

4. A box is placed in the back of a truck. The box is not tied down. When the truck accelerates forward, the box moves towards the back of the truck. Explain why this happens referring to Newton's laws of motion.

The box moves to the back of the truck because it is at rest. Newton's first law states that objects at rest want to remain at rest unless an unbalanced external force acts on it. The truck moved, but no force was exerted on the box because it was not tied down. Therefore, it stayed at rest while the truck moved out from underneath it.

5. A car traveling 20 m/s brakes and slides on a slippery surface (k = 0.10 m/s). Calculate the distance the car travels while braking.

$$d = kv^2$$
$$d = (0.10)(20)^2$$
$$d = 40\ m$$

6. How would the stopping distance of a car change if the driver's reaction time increased? Why?

The stopping distance would increase because the car is still moving forward during the time that the driver is reacting.