Assignment 2

To the instructor:
As an instructor, I have not collected this assignment.

1. The mass of a ball and cart system is equal to a constant value. However, the ball changes position, as does the mass of the ball. Which of the following methods is correct?
   a) Measure the total mass of the system and calculate the center of mass.
   b) Measure the mass of the ball and the cart separately and calculate the center of mass.
   c) Measure the mass of the ball and the cart together as a system, and measure the center of mass of the system.
   d) None of the above.

2. A spring with a spring constant of 10 N/m is used to support a mass. If the spring is compressed by 0.05 m, what is the force exerted by the spring?
   a) 0.5 N
   b) 0.25 N
   c) 0.50 N
   d) 1.0 N

3. The expression for the resistance of a circuit is given as R = \frac{V}{I}. Which of the following is true?
   a) Resistance is directly proportional to voltage and inversely proportional to current.
   b) Resistance is inversely proportional to voltage and directly proportional to current.
   c) Resistance is directly proportional to the square of the current and inversely proportional to the square of the voltage.
   d) Resistance is directly proportional to the square of the voltage and inversely proportional to the square of the current.

4. The resistance of a metal wire is given as R = \frac{\rho L}{A}. Which of the following statements is true?
   a) The resistance is directly proportional to the length of the wire and inversely proportional to the cross-sectional area.
   b) The resistance is inversely proportional to the length of the wire and directly proportional to the cross-sectional area.
   c) The resistance is directly proportional to the length of the wire and directly proportional to the cross-sectional area.
   d) The resistance is inversely proportional to the length of the wire and inversely proportional to the cross-sectional area.

5. A capacitor has a capacitance of 10 \mu F and is connected to a voltage source of 100 V. If the voltage is increased to 200 V, how much energy is stored in the capacitor?
   a) 10 J
   b) 20 J
   c) 100 J
   d) 200 J

6. The energy stored in a capacitor is given by \frac{1}{2}CV^2. Which of the following is true?
   a) The energy is directly proportional to the capacitance and the square of the voltage.
   b) The energy is inversely proportional to the capacitance and the square of the voltage.
   c) The energy is directly proportional to the capacitance and inversely proportional to the square of the voltage.
   d) The energy is inversely proportional to the capacitance and directly proportional to the square of the voltage.

Diagram:

- A circuit diagram showing a capacitor connected to a voltage source.
- The formula for the energy stored in a capacitor: \frac{1}{2}CV^2.
- Labels for the circuit elements: Capacitor (C), Voltage Source (V), Energy (E).