A. \[15 \text{ pts.}] A mass \( m \) is attached to a spring and oscillating on a frictionless, horizontal surface. See figure. At the instant the mass passes the equilibrium position moving to the right, half the mass detaches from the other half. The oscillating system is now the spring and half the original mass with the detached mass moving off to the right with constant velocity. Relative to the original spring-mass system, the new spring-mass system with half the mass oscillates with...

In the spaces provided below, enter the words larger, smaller or the same that best completes the above sentence.

1. SMALLER amplitude
2. SMALLER period
3. LARGER frequency
4. SAME maximum velocity
5. SMALLER mechanical energy

B. \[12 \text{ pts.}] A solid cylinder is floating at the interface between water and oil with 3/4 of the cylinder in the water region and 1/4 of the cylinder in the oil region. See figure. Select the item in the parenthesis that best fits the statement.

1. WATER The item (oil, water, and/or cylinder) with the largest density.
2. OIL The item (oil, water, and/or cylinder) with the smallest density.
3. GREATER Than The weight of the cylinder (is equal to, greater than or less than) the total buoyant force it feels.
4. LESS THAN The density of the cylinder (is equal to, less than, or greater than) the density of water.

C. \[9 \text{ pts.}] Three thermometers in different settings record temperatures \( T_1 = 1000^\circ \text{F} \), \( T_2 = 1000^\circ \text{C} \), and \( T_3 = 1000 \text{ K} \). In the space below select \( T_1 \), \( T_2 \) or \( T_3 \), that best fits the statement.

1. \( T_2 \) The thermometer in the hottest environment.
2. \( T_1 \) The thermometer in the coolest environment.
3. \( T_2 \) The thermometer reading a temperature 900° above the boiling point of water.