SHM concept WS (answers)

1. Since the mass of the real spring will ADD to the total mass of the system, the period will INCREASE and the frequency will DECREASE.

2. Changing the amplitude will have NO EFFECT on the frequency of the SHM.

3. At higher altitude, *'g'* decreases; this will cause the period of the pendulum to INCREASE. Since it will take longer to swing back and forth, the clock will "run slow" and will "LOSE TIME".

4. The mass of bob has NO EFFECT on the frequency of the pendulum. However, increasing the length by a factor of 4 will cause the period to double and the frequency TO BE CUT IN HALF.

5. a. Either decreasing the length of the swing or moving it to a location with a larger 'g' value will increase the frequency.

    b. At every point **except the equilibrium point.** At each of those positions, bob's motion is somewhat vertical. This causes the gravitational force on it to have a non-zero component ($F_{g \, (parallel)}$) along the line of motion.

    c. At the equilibrium point.

    d. No it would not. Gravitational force on bob is what causes the acceleration; without it, bob would either not move at all or travel at a constant speed in a circular path.

6. a. Either replace the spring with a more flexible one (smaller spring constant, k , value) or add mass to the bouncer.

    b. No as he moves **toward the equilibrium point** in either direction his acceleration DECREASES. As he moves **away** it INCREASES.

    c. His speed is ZERO, and his acceleration is directed DOWNWARD. This is due to the fact that the downward force of gravity is larger than the upward force exerted by the spring.

    d. The forces are balanced at the EQUILIBRIUM POINT.

    e. No; the gravitational field strength does not affect the period of oscillation of the system.