SHM Dynamics WS **KEY**

1. At which point(s) in its cycle is the speed of a mass on a spring the greatest? At which point(s) is its speed zero?

The speed is a maximum when the mass is at the equilibrium point. The speed is zero at the endpoints.

2. At which point(s) in its cycle is the tangential (linear) acceleration of a pendulum the greatest? At which point(s) is its tangential acceleration zero?

The acceleration is a maximum when bob is at the endpoints. The acceleration is zero at the equilibrium point.

3. In which direction is the pendulum bob accelerating when it is moving toward an endpoint?

It is accelerating toward the equilibrium point.

4. In which direction is a mass on a spring accelerating when it is moving toward the equilibrium point?

It is accelerating toward the equilibrium point.

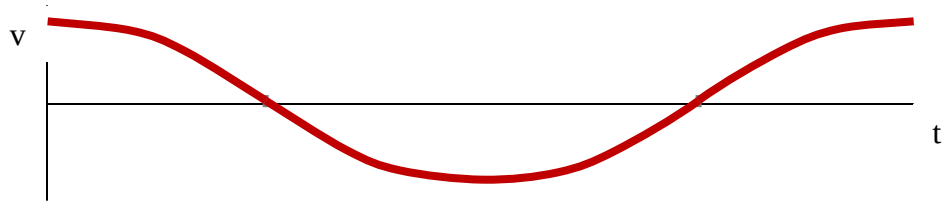
5. Describe how the speed of a pendulum bob changes as it moves from one endpoint to the opposite endpoint.

The speed starts at zero, increases continuously until bob reaches the equilibrium point. It then begins to decrease continuously, becoming zero at the opposite endpoint.

6. A mass attached to a spring is moving in SHM and its speed is decreasing. What is happening to its acceleration during this interval?

Its acceleration is increasing, since it is moving away from the equilibrium point.

7. Using the graph axes below, draw a line representing the velocity of a pendulum bob during one cycle of SHM. At time t=0, the bob is at the equilibrium point.



8. What force is directly responsible for the tangential (linear) acceleration of a pendulum bob? How can it cause different accelerations at different points if it is a constant-magnitude force?

As bob moves away from the equilibrium point, its direction of motion becomes increasingly vertical. Therefore, the parallel component of gravity acting on bob increases.

9. Which force is directly responsible for the acceleration pattern of a mass oscillating at the end of a spring? Describe the characteristic of this force that produces the acceleration pattern experienced by the mass.

The restoring force of the spring when it is deformed is responsible for the acceleration pattern of the mass. The magnitude of this force depends on the amount by which the spring is deformed. The further it is stretched or compressed from its rest length, the greater restoring force it exerts.