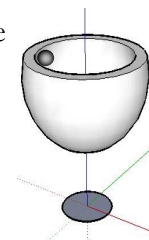# KC's Multiple Select
## SHO

- *Wave-Oscillations.SHO***.MS.KC.1:** The ball in the figure resides in a frictionless bowl whose cross-sectional shape is quadratic. The ball is released from rest at the left side of the bowl, as shown in the figure. Which of the following statements are false regarding this situation?
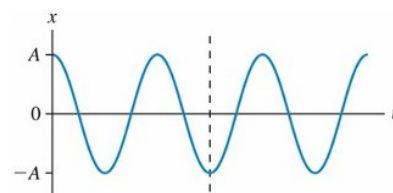
  

    (a) The ball undergoes simple harmonic motion.
    (b) The normal force from the bowl supplies a restoring force on the ball.
    (c) Gravity supplies a restoring force on the ball.
    (d) The motion of the ball can be modeled using sinusoidal functions.
    (e) The time to complete one cycle depends on how far up the side of the bowl the ball starts from.

- *Wave-Oscillations.SHO***.MS.KC.2:** Which one of the following statements is true concerning an object undergoing simple harmonic motion in 1 dimension?
    (a) Its velocity is never zero.
    (b) Its acceleration is never zero.
    (c) Its velocity and acceleration can be simultaneously zero.
    (d) Its velocity is zero when its acceleration is a maximum.
    (e) Its maximum acceleration can be equal to its maximum velocity.

- *Wave-Oscillations.SHO***.MS.KC.3:** An object is undergoing simple harmonic motion. Which of the following statements are *false* about the acceleration of this object?
    (a) The acceleration is a maximum when the object is instantaneously at rest.
    (b) The acceleration is a maximum when the displacement of the object is zero.
    (c) The acceleration is zero when the speed of the object is a maximum.
    (d) The acceleration is a maximum when the displacement of the object is a maximum.
    (e) The acceleration is a maximum when the speed of the object is a maximum.

- *Wave-Oscillations.SHO***.MS.KC.4:** Which of the following are features of *all* oscillators?
    (a) Linear restoring force
    (b) Potential energy well
    (c) Period is independent of amplitude
    (d) Period is independent of energy
    (e) Linear change in position as a function of time

- *Wave-Oscillations.SHO*.**MS.KC.5:** Which of the following statements are true concerning an object executing simple harmonic motion?
    - (a) Its velocity is never zero.
    - (b) Its acceleration is never zero.
    - (c) Its velocity and acceleration are simultaneously zero.
    - (d) Its velocity is zero when its acceleration is a maximum.
    - (e) Its maximum acceleration is equal to its maximum velocity.
    - (f) Its acceleration is maximum when its displacement is maximum.

- *Wave-Oscillations.SHO*.**MS.KC.6:** The position graph of a mass connected to a horizontal spring is in the figure. Which of the following statements regrading the instant indicated by the dotted line are true.
    - (a) The mass is undergoing the largest acceleration that points in the positive direction.
    - (b) The mass is undergoing the largest acceleration that points in the negative direction.
    - (c) The mass is undergoing the smallest magnitude acceleration.
    - (d) The mass is moving in the positive direction.
    - (f) The mass is moving in the negative direction.
    - (e) The mass is at its equilibrium location.
    - (g) The mass + spring system has maximum potential energy
    - (h) The mass + spring system has maximum kinetic energy



- *Wave-Oscillations.SHO*.**MS.KC.7:** A buoy bobs up and down, undergoing near simple harmonic motion. Which of the following statements are true about the buoy?
    - (a) The buoyancy force is a maximum when the buoy moves the fastest.
    - (b) The buoyancy force is *always* a maximum when the displacement of the buoy from equilibrium is greatest.
    - (c) The acceleration of the buoy is maximum when it's speed is zero.
    - (d) The acceleration of the buoy is zero when it's speed is zero.
    - (e) The time it takes the buoy's velocity to go from a minimum to maximum is the same amount of time it takes it's acceleration to go from a minimum to a maximum.

- *Wave-Oscillations.SHO*.**MS.KC.8:** The acceleration of a certain simple harmonic oscillator is given by the equation to the right. Which of the following statements are *false*?

$$a(t) = -\left(15.8\,\frac{m}{s^2}\right)\cos\left(\left(2.51\,\frac{rad}{s}\right)t\right)$$

- (a) Two times the period is equal to 5.00 s.
- (b) The maximum displacement of the oscillator is equal to 2.51 m.
- (c) The acceleration of the oscillator after 1 second is –15.8 m/s$^2$.
- (d) The maximum speed of the oscillator is 6.29 m/s.
- (e) The frequency of the oscillator is 0.20 Hz.