1.



***Answer: C = D > A = B.***

***The frequency is the inverse of the period or time for one complete swing. So the higher the frequency the smaller***

***the time. The period is independent of the mass of the bob and depends only on the length.***

1.



 ***Answer: B = D > A = C.***

***The frequency is the inverse of the period or time for one complete swing. So the higher the frequency the***

***smaller the time. The period is independent of the mass of the bob.***

1.



***Answer: C = D > B > A.***

***The period is given by the square root of the mass divided by the spring constant. The period is independent of the***

***amplitude.***

1.



***Answer: 8 seconds.***

***The period is the time for the complete cycle of the oscillation so we measure along the horizontal, time, axis***

***from the same point—peak to peak, or trough to rough, etc—on two successive cycles..***



***Answer: 1/8 Hz.***

***The period is 8 seconds from the graph. The frequency is the reciprocal of the period or***

***1/8 Hz.***

1.



***Answer: Aileen is correct.***

***Since maximum displacement is the point where the spring is stretched, or compressed, the most the force exerted***

***by the spring has to be largest there.***

1.







**Explain your reasoning.**

***Answer: The signs for the displacement can be read from the graph. The velocity is related to the slope of the***

***graph at these points. The force exerted by a spring is always directed opposite to the displacement from***

***equilibrium. In this case, the spring force is the net force and the acceleration has the same direction as the net***

***force.***

7.

 

1. At which point or points are the spring potential energy and the cart’s kinetic energy both at their maximum values? Explain your reasoning.

***None.***

***The spring potential energy and the cart’s kinetic energy always add up to the total energy, which is constant. So***

***if one is at a maximum value, the other is at a minimum value.***

1. At which point or points is the kinetic energy equal to aero? Explain your reasoning.

***Points A and E.***

***The slope of the graph is zero at these points indicating zero velocity.***

1. At which point or points is the total energy at its maximum value? Explain your reasoning.

***A, B, C, D, E, F, G, and H.***

***The total energy is always the same.***

1. At which point or points is the spring potential energy negative? Explain your reasoning.

***None. The spring potential energy is proportional to the square of the distance the spring is stretched or***

***compressed, and is always positive or zero.***

1. At which point or points is the kinetic energy positive? Explain your reasoning.

***Points B, C, D, F, G and H.***

***The kinetic energy is always either positive or zero.***

1. At which point or points is the kinetic energy at its maximum value and the spring potential energy at its minimum value? Explain your reasoning.

***Points C and G.***

***When the cart is in the equilibrium position the spring is unstretched and there is no spring potential energy. At***

***these points the kinetic energy of the cart is equal to the total energy.***

1. At which point or points is the kinetic energy at its minimum value and the spring potential energy at its maximum value: Explain your reasoning.

***Points A and E.***

***When the cart is at its maximum displacement the cart is momentarily at rest and the kinetic energy is zero.***