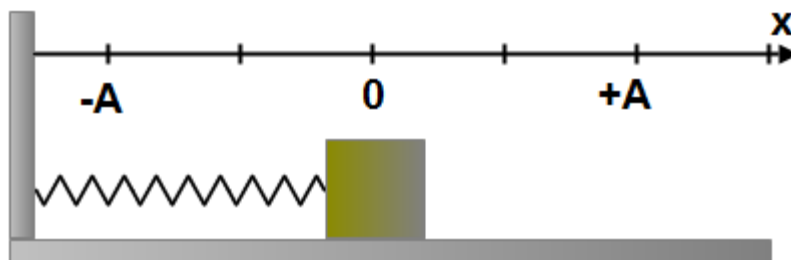


## PSI Physics Simple Harmonic Motion (SHM)

### Multiple-Choice Questions

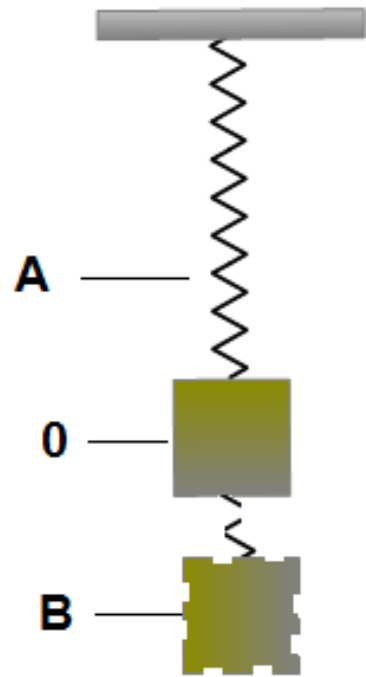
1. A mass on a spring undergoes SHM. The maximum displacement from the equilibrium is called?  
A. Period      B. Frequency      C. Amplitude      D. Wavelength      E. Speed
2. In a periodic process, the number of cycles per unit of time is called?  
A. Period      B. Frequency      C. Amplitude      D. Wavelength      E. Speed
3. In a periodic process, the time required to complete one cycle is called?  
A. Period      B. Frequency      C. Amplitude      D. Wavelength      E. Speed

A mass in the diagram to the right undergoes simple harmonic motion. Use this diagram to answer questions 4 through 7.



4. When the mass reaches point  $x = +A$  its instantaneous velocity is?  
A. Maximum and positive      B. Maximum and negative  
C. Zero      D. Less than maximum and positive  
E. Less than maximum and negative
5. When the mass reaches point  $x = 0$  its instantaneous velocity is?  
A. Maximum and can be positive or negative  
B. Constant and doesn't depend on the location  
C. Zero  
D. Slightly less than maximum and positive  
E. Slightly less than maximum and negative
6. When the mass reaches point  $x = +A$  its instantaneous acceleration is?  
A. Maximum and positive      B. Maximum and negative  
C. Zero      D. Slightly less than maximum and positive  
E. Slightly less than maximum and negative
7. When the mass reaches point  $x = 0$  its instantaneous acceleration is?  
A. Maximum and positive      B. Maximum and negative  
C. Zero      D. Slightly less than maximum and positive  
E. Slightly less than maximum and negative

In the diagram to the right, a mass suspended at the end of an elastic spring undergoes SHM between point A and B. Use this diagram for questions 8 and 9.



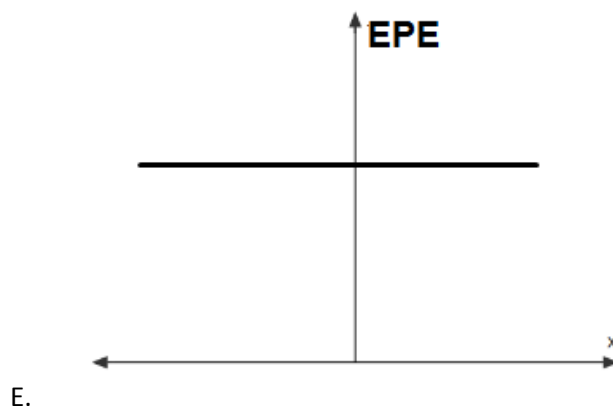
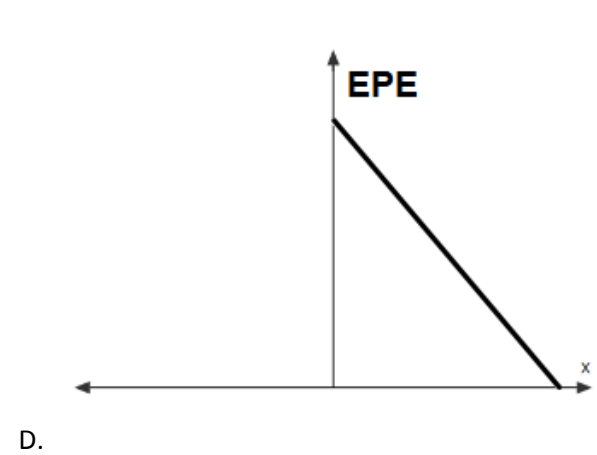
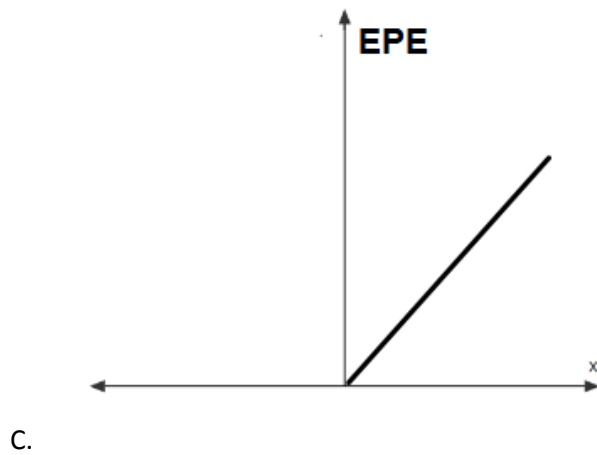
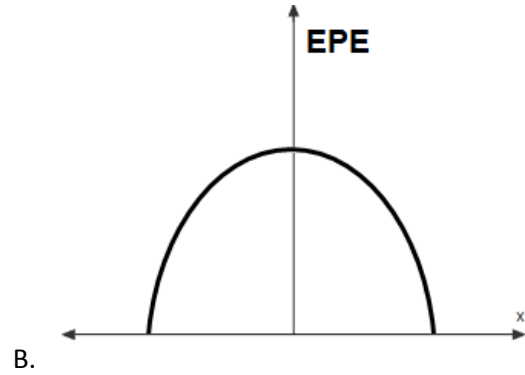
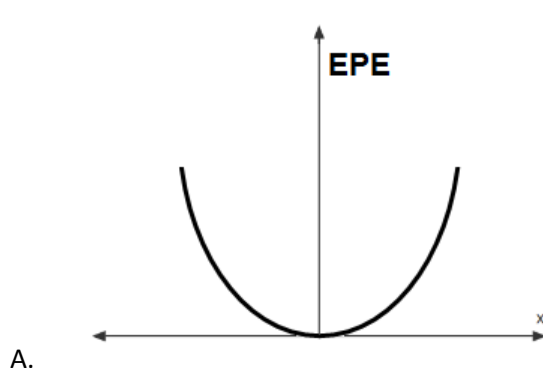
8. At which location of the mass the system has the maximum kinetic energy?
  - A. Only point A
  - B. Only point B
  - C. Only point O
  - D. Point A and B
  - E. The kinetic energy remains constant
9. At which location of the mass the system has the maximum elastic potential energy?
  - A. Only point A
  - B. Only point B
  - C. Only point O
  - D. Point A and B
  - E. The potential energy remains constant
10. A mass-spring oscillating system undergoes SHM with maximum amplitude A. If the amplitude is doubled what effect will it produce on the mechanical energy of the system?
  - A. The energy is increased by factor two
  - B. The energy is increased by factor four
  - C. The energy is decreased by factor two
  - D. The energy is decreased by factor four
  - E. It doesn't affect the energy
11. A mass-spring oscillating system undergoes SHM with maximum amplitude A. If the spring constant is doubled what effect will it produce on the mechanical energy of the system?
  - A. The energy is increased by factor two
  - B. The energy is increased by factor four
  - C. The energy is decreased by factor two
  - D. The energy is decreased by factor four
  - E. It doesn't affect the energy
12. An object with a mass  $M$  is suspended from an elastic spring with a spring constant  $k$ . The object oscillates with maximum amplitude A. If the amplitude of oscillations is doubled, how it will change the period of oscillations?
  - A. The period is increased by factor two
  - B. The period is increased by factor four
  - C. The period is decreased by factor two
  - D. The period is decreased by factor four
  - E. The period remains the same

13. An object with a mass  $M$  is suspended from an elastic spring with a spring constant  $k$ . The object oscillates with period  $T$ . If the mass of oscillations is quadrupled, how it will change the period of oscillations?
- A. The period is increased by factor two
  - B. The period is increased by factor four
  - C. The period is decreased by factor two
  - D. The period is decreased by factor four
  - E. The period remains the same
14. An object with a mass  $M$  is suspended from an elastic spring with a spring constant  $k$ . The object oscillates with period  $T$  on the surface of Earth. If the oscillating system is moved to the surface of Moon, how it will change the period of oscillations? *Acceleration due to gravity on moon =  $1.6 \text{ m/s}^2$*
- A. The period is increased by factor  $\sqrt{6}$
  - B. The period is increased by factor four
  - C. The period is decreased by factor  $\sqrt{6}$
  - D. The period is decreased by factor four
  - E. The period remains the same
15. A mass  $M$  suspended from a string  $L$  undergoes SHM. Which of the following is true about the period of oscillations?
- A. The period increases with increasing amplitude
  - B. The period increases with increasing mass
  - C. The period increases with decreasing length
  - D. The period increases with increasing length
  - E. The period doesn't depend on acceleration due to gravity
16. A simple pendulum is moved from the Earth to the Moon. How does it change the period of oscillations? *Acceleration due to gravity on moon =  $1.6 \text{ m/s}^2$*
- A. The period is increased by factor  $\sqrt{6}$
  - B. The period is increased by factor four
  - C. The period is decreased by factor  $\sqrt{6}$
  - D. The period is decreased by factor four
  - E. The period remains the same
17. The length of a simple pendulum oscillating with a period  $T$  is quadrupled, what is the new period of oscillations in terms of  $T$ ?
- A.  $2T$
  - B.  $4T$
  - C.  $T$
  - D.  $\frac{1}{2}T$
  - E.  $\frac{1}{4}T$
18. A simple pendulum has a period of 1 s. What is the length of the string?
- A. 1 m
  - B. 2 m
  - C. 4 m
  - D.  $\frac{1}{2} \text{ m}$
  - E.  $\frac{1}{4} \text{ m}$

19. A simple pendulum with a length of 1 m oscillates on the surface of a hypothetical planet X. What is the surface gravity on the planet if the period of oscillations is 4 s?

- A.  $1.6 \frac{m}{s^2}$       B.  $3.7 \frac{m}{s^2}$       C.  $11.2 \frac{m}{s^2}$       D.  $2.5 \frac{m}{s^2}$       E.  $9.8 \frac{m}{s^2}$

20. A mass-spring oscillating system undergoes SHM. Which of the following graphs represents the elastic potential energy as a function of position?



### Answer Guide

1. C
2. B
3. A
4. C
5. A
6. B
7. C
8. C
9. D
10. B
11. A
12. E
13. A
14. E
15. D
16. A
17. A
18. E
19. D
20. A