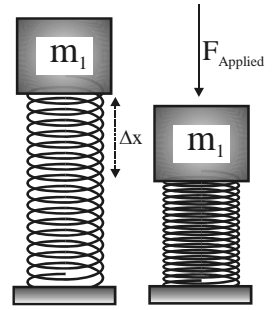


# CONCEPTUAL ENERGY CONSERVATION REVIEW

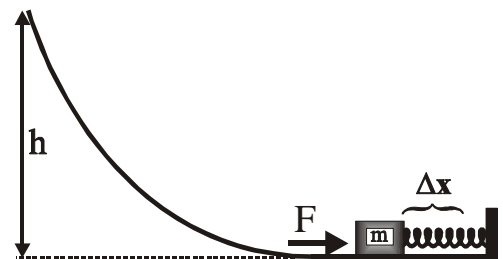
**Assume throughout that the lowest point reached by the object corresponds to  $h=0!$**

**A mass is compressed on top of a vertical spring by an applied force  $F$ . The mass is then released and is allowed to be thrown upward.**



- \_\_\_ 1. What kinds of energy will the system contain while the mass is compressed against the spring?  
 A. KE      B. GPE      C. EPE      D. KE & GPE  
 E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE
- \_\_\_ 2. What kinds of energy will the system contain just as the mass loses contact with the end of the spring?  
 A. KE      B. GPE      C. EPE      D. KE & GPE  
 E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE
- \_\_\_ 3. What kinds of energy will the system contain just as this mass reaches the highest point?  
 A. KE      B. GPE      C. EPE      D. KE & GPE  
 E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE
- \_\_\_ 4. Which of the following equations will properly relate the energy of the system when the mass is compressed against the spring with the energy of the system **just as** the mass loses contact with the spring?  
 A.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$       B.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       E.  $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       F.  $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v^2$
- \_\_\_ 5. Which of the following equations will properly relate the energy of the system when the mass is compressed against the spring with the energy of the system when the mass reaches the highest point?  
 A.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$       B.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       E.  $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       F.  $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v^2$

**A mass  $m$  is compressed a distance of  $\Delta x$  against a spring which has a spring constant of  $k$  as shown to the right. After the compression the front of the mass sits a distance of  $x$  from the bottom of a curved hill. Initially assume that there is no friction.**



- \_\_\_ 6. What kinds of energy will this system contain immediately before the mass is released from the spring?  
 A. KE      B. GPE      C. EPE  
 B. KE & GPE      E. EPE & KE  
 C. EPE & GPE      G. EPE & GPE & KE

**The mass is released from the spring and is allowed to slide along the horizontal surface.**

- \_\_\_ 7. What kinds of energy will this system contain immediately after the mass loses contact with the spring but before it reaches the curved hill?  
 A. KE      B. GPE      C. EPE      D. KE & GPE  
 E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE
- \_\_\_ 8. Which of the following equations relates the total energy of the system immediately **before** the mass is released from the spring and immediately **after** the mass leaves the spring?  
 A.  $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v^2$       B.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       E.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       F.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$

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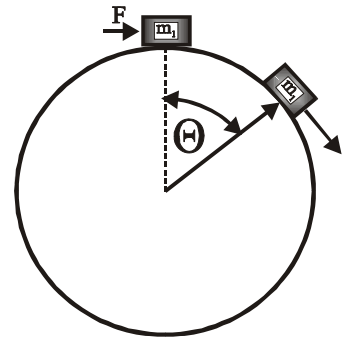
**The mass slides up the hill until it finally stops at a height  $h$  above its starting point.**

- \_\_\_ 9. What kinds of energy does the system contain at a point half way  $h/2$  up the hill?  
 A. KE      B. GPE      C. EPE      D. KE & GPE  
 E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE
- \_\_\_ 10. Which of the following equations relates the total energy of the system immediately **before** the mass is released from the spring and **at** a point half way  $h/2$  up the hill?  
 A.  $m \cdot g \cdot h/2 = \frac{1}{2} \cdot m \cdot v^2$       B.  $m \cdot g \cdot h/2 = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h/2 = \frac{1}{2} \cdot k \cdot \Delta x^2$       E.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h/2$       F.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h/2$   
 G.  $\frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h/2 + \frac{1}{2} \cdot m \cdot v^2$
- \_\_\_ 11. What kinds of energy will this system contain when the mass comes briefly to a halt on the hill?  
 A. KE      B. GPE      C. EPE      D. KE & GPE  
 E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE
- \_\_\_ 12. Which of the following equations relates the total energy of the system immediately **before** the mass is released from the spring and at the brief **moment** that the mass stops at the highest point  $h$  on the hill?  
 A.  $m \cdot g \cdot h/2 = \frac{1}{2} \cdot m \cdot v^2$       B.  $m \cdot g \cdot h/2 = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h/2 = \frac{1}{2} \cdot k \cdot \Delta x^2$       E.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h/2$       F.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h/2$   
 G.  $\frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h/2 + \frac{1}{2} \cdot m \cdot v^2$

**Suppose, instead, that this surface is NOT frictionless.**

- \_\_\_ 13. Which of the following equations relates the total energy of the system immediately **before** the mass is released from the spring and at the brief **moment** that the mass stops at the highest point  $h$  on the hill?  
 A.  $m \cdot g \cdot h > \frac{1}{2} \cdot m \cdot v^2$       B.  $m \cdot g \cdot h < \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v^2 > \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h < \frac{1}{2} \cdot k \cdot \Delta x^2$       E.  $\frac{1}{2} \cdot m \cdot v^2 \leq \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       F.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 > m \cdot g \cdot h$   
 G.  $\frac{1}{2} \cdot k \cdot \Delta x^2 > m \cdot g \cdot h + \frac{1}{2} \cdot m \cdot v^2$

**Consider a large sphere which has a radius of  $R$  and is frictionless. A mass of  $m_1$  is initially sitting on top of the sphere. This object is given a very small push by a force  $F$ , which is then immediately removed, which gives the object a small initial velocity  $V_0$  to the right.**



- \_\_\_ 14. What kinds of energy will this system contain immediately **before** the mass has been given this brief push?  
 A. KE      B. GPE      C. EPE  
 D. KE & GPE      E. EPE & KE      F. EPE & GPE  
 G. EPE & GPE & KE
- \_\_\_ 15. What kinds of energy will this system contain immediately **after** the mass has been given this brief push?  
 A. KE      B. GPE      C. EPE  
 D. KE & GPE      E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE

**At some time later the mass  $m_1$  leaves the surface of the frictionless sphere as shown.**

- \_\_\_ 16. What kinds of energy will this system contain at the moment that the mass  $m_1$  leaves the surface of the sphere?  
 A. KE      B. GPE      C. EPE      D. KE & GPE  
 E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE

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17. Which of the following equations will properly relate the total energy of the system immediately **after** the mass has been given a brief push and at the **moment** that the mass leaves the surface of the sphere?
- A.  $m_1 \cdot g \cdot h = \frac{1}{2} \cdot m_1 \cdot v_f^2$       B.  $m_1 \cdot g \cdot h = \frac{1}{2} \cdot m_1 \cdot v_o^2$       C.  $\frac{1}{2} \cdot m_1 \cdot v_o^2 = \frac{1}{2} \cdot m_1 \cdot v_f^2$   
 D.  $\frac{1}{2} \cdot m_1 \cdot v_o^2 + m_1 \cdot g \cdot h = \frac{1}{2} \cdot m_1 \cdot v_f^2$       E.  $\frac{1}{2} \cdot m_1 \cdot v_o^2 = \frac{1}{2} \cdot m_1 \cdot v_f^2 + m_1 \cdot g \cdot h$   
 F.  $\frac{1}{2} \cdot m_1 \cdot v_f^2 + \frac{1}{2} \cdot m_1 \cdot v_o^2 = m_1 \cdot g \cdot h$

**You are on top of a building, which has a height  $h$ , when you throw a ball at an angle  $\alpha$  as shown below. After flying through the air the ball comes into contact with a spring, whose length is very small compared to the height of the building. The ball strikes the spring compressing it until the ball briefly comes to rest.**



18. What kinds of energy will the system contain **just as** the ball leaves the roof of the building?
- A. KE      B. GPE      C. EPE      D. KE & GPE      E. EPE & KE  
 F. EPE & GPE      G. EPE & GPE & KE
19. What kinds of energy will the system contain **just as** the ball reaches the highest point of its trajectory?
- A. KE      B. GPE      C. EPE      D. KE & GPE      E. EPE & KE  
 F. EPE & GPE      G. EPE & GPE & KE
20. What kinds of energy will the system contain **just as** the ball reaches the spring [but before it touches the spring]?
- A. KE      B. GPE      C. EPE      D. KE & GPE      E. EPE & KE  
 F. EPE & GPE      G. EPE & GPE & KE
21. What kinds of energy will the system contain **just as** the ball strikes the spring and comes briefly to rest?
- A. KE      B. GPE      C. EPE      D. KE & GPE      E. EPE & KE  
 F. EPE & GPE      G. EPE & GPE & KE
22. Which of the following equations will properly relate the total energy of the system as the ball leaves the roof of the building with the total energy of the system as the ball reaches the highest point of its trajectory?
- A.  $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_o^2$       B.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v_o^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v_o^2 + m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_f^2$       E.  $\frac{1}{2} \cdot m \cdot v_f^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       F.  $\frac{1}{2} \cdot m \cdot v_o^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$
23. Which of the following equations will properly relate the total energy of the system **as** the ball leaves the roof of the building with the total energy of the system at the moment that the ball reaches but **before** it compresses the spring?
- A.  $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_f^2$       B.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v_o^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v_o^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       E.  $\frac{1}{2} \cdot m \cdot v_o^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       F.  $\frac{1}{2} \cdot m \cdot v_o^2 + m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_f^2$
24. Which of the following equations will properly relate the total energy of the system as the ball leaves the roof of the building with the total energy of the system as the ball comes to rest against the spring?
- A.  $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_f^2$       B.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v_o^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v_o^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       E.  $\frac{1}{2} \cdot m \cdot v_o^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       F.  $\frac{1}{2} \cdot m \cdot v_o^2 + m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_f^2$

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Suppose that three different balls were thrown from this roof at the same time and with the same speed such that the first ball  $B_1$  was thrown straight up, the second ball  $B_2$  was thrown straight down and the third ball  $B_3$  was thrown horizontally.

- \_\_\_ 25. How will the speeds of these balls compare as each ball reaches the ground?  
 A.  $v_1 > v_3 > v_2$     B.  $v_1 > v_3 = v_2$     C.  $v_1 < v_3 < v_2$     D.  $v_1 = v_3 = v_2$     E.  $v_1 < v_3 > v_2$
- \_\_\_ 26. Which of these balls will have the greatest kinetic energy as each ball reaches the ground?  
 A.  $B_1$     B.  $B_2$     C.  $B_3$     D.  $B_1 = B_2 = B_3$     E.  $B_1 > B_2 > B_3$     F.  $B_1 > B_3 > B_2$

A mass is compressed against a spring as shown to the right. The mass is then released and is then allowed to slide across a horizontal, frictionless surface.



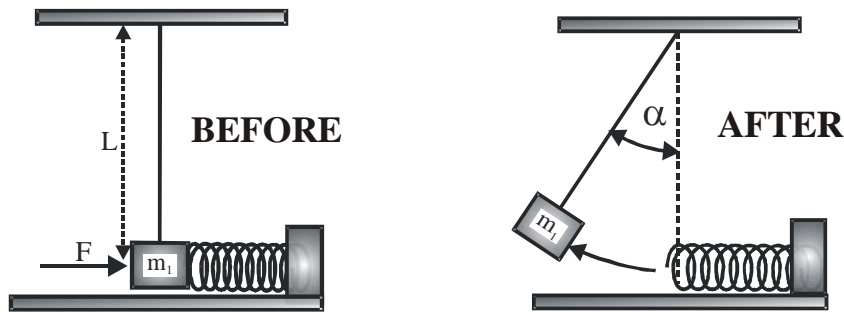
- \_\_\_ 27. What kinds of energy will this system contain immediately before the mass is released?  
 A. KE    B. GPE    C. EPE    D. KE & GPE  
 E. EPE & KE    F. EPE & GPE    G. EPE & GPE & KE
- \_\_\_ 28. Which of the following relationships describes the energy of this system immediately **before** the mass is released?  
 A.  $\frac{1}{2} \cdot m \cdot v^2$     B.  $m \cdot g \cdot h$     C.  $\frac{1}{2} \cdot k \cdot \Delta x^2$     D.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2$     E.  $m \cdot g \cdot h + \frac{1}{2} \cdot k \cdot \Delta x^2$
- \_\_\_ 29. What kinds of energy will this system contain immediately after the mass is released and has lost contact with the spring?  
 A. KE    B. GPE    C. EPE    D. KE & GPE    E. EPE & KE  
 F. EPE & GPE    G. EPE & GPE & KE
- \_\_\_ 30. Which of the following relationships describes the energy of this system immediately **after** the mass is released from the spring?  
 A.  $\frac{1}{2} \cdot m \cdot v^2$     B.  $m \cdot g \cdot h$     C.  $\frac{1}{2} \cdot k \cdot \Delta x^2$     D.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2$     E.  $m \cdot g \cdot h + \frac{1}{2} \cdot k \cdot \Delta x^2$

Assume now that this surface is **NOT** frictionless and as a result the mass gradually slides to a halt!

- \_\_\_ 31. Which of the following equations describes the energy of this system immediately **before** the mass is released from the spring and **after** the mass has come to rest on the horizontal surface?  
 A.  $\frac{1}{2} \cdot k \cdot \Delta x^2 = \frac{1}{2} \cdot m \cdot v^2$     B.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$     C.  $F_f \cdot d = \frac{1}{2} \cdot k \cdot \Delta x^2$     D.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = F_f \cdot d$   
 E.  $\frac{1}{2} \cdot k \cdot \Delta x^2 = \frac{1}{2} \cdot m \cdot v^2 + F_f \cdot d$     F.  $\frac{1}{2} \cdot k \cdot \Delta x^2 + F_f \cdot d = \frac{1}{2} \cdot m \cdot v^2$
- \_\_\_ 32. What happened to the energy of this system from the time that the mass is released from the spring until the mass comes to rest on the horizontal surface?  
 A. The kinetic energy has been converted into gravitational energy.  
 B. The elastic energy has been converted into chemical energy.  
 C. The elastic energy has been converted into heat energy.  
 D. The kinetic energy has been converted into elastic energy.  
 E. The elastic energy has been converted into nuclear energy.

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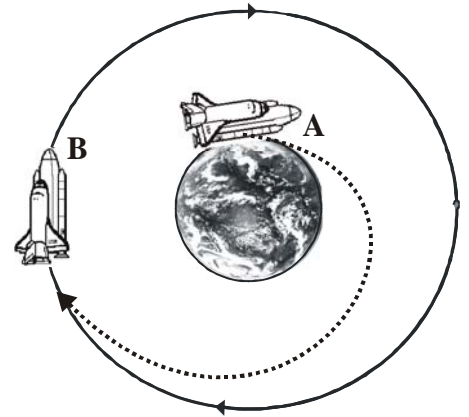
A mass is suspended from the end of a string. This mass is then compressed against a spring as shown to the right. The mass is then released and is allowed to swing off to the left until at some point the mass stops rising. Assume that the string is much longer than the spring.



- \_\_\_ 33. What kinds of energy will the system contain immediately before the mass is released?  
 A. KE                      B. GPE                      C. EPE                      D. KE & GPE  
 E. EPE & KE              F. EPE & GPE              G. EPE & GPE & KE
- \_\_\_ 34. What kinds of energy will the system contain just as the mass loses contact with the spring?  
 A. KE                      B. GPE                      C. EPE                      D. KE & GPE  
 E. EPE & KE              F. EPE & GPE              G. EPE & GPE & KE
- \_\_\_ 35. What kinds of energy will the system contain just as the mass reaches the highest point?  
 A. KE                      B. GPE                      C. EPE                      D. KE & GPE  
 E. EPE & KE              F. EPE & GPE              G. EPE & GPE & KE
- \_\_\_ 36. Which of the following equations will properly relate the energy of the system when the mass is compressed against the spring with the energy of the system just as the mass loses contact with the spring?  
 A.  $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v^2$       B.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       E.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       F.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$
- \_\_\_ 37. Which of the following equations will properly relate the energy of the system when the mass is compressed against the spring with the energy of the system when the mass reaches the highest point?  
 A.  $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v^2$       B.  $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       C.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
 D.  $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$       E.  $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$       F.  $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$
- \_\_\_ 38. What kind of energy conversion is involved in a bullet being fired from a gun?  
 A. Gravitational energy is being converted into chemical energy.  
 B. Heat energy is being converted into kinetic energy.  
 C. Kinetic energy is being converted into heat.  
 D. Elastic energy is being converted into gravitational energy.  
 E. Work is being converted into elastic energy.

## CONCEPTUAL ENERGY CONSERVATION REVIEW

The Space Shuttle is initially sitting at rest on the surface of the earth at location A. The Shuttle is then launched from the Earth's surface such that it goes into orbit around the Earth in a stable circular orbit at point B.

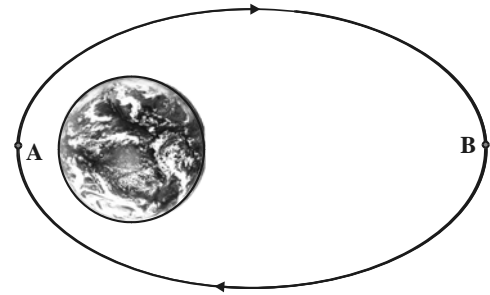


- \_\_\_ 39. What kinds of energy will the Space Shuttle contain while sitting at rest on the surface of the Earth before launch?
- A. KE      B. GPE      C. EPE      D. KE & GPE  
E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE
- \_\_\_ 40. What kinds of energy will the Space Shuttle contain after going into orbit at point B?
- A. KE      B. GPE      C. EPE      D. KE & GPE  
E. EPE & KE      F. EPE & GPE      G. EPE & GPE & KE
- \_\_\_ 41. When the shuttle is orbiting the Earth it contains a lot of energy while a space shuttle sitting at rest on the Earth contains no energy relative to the Earth's surface at all. Where does the energy of the orbiting shuttle go as it goes from orbit to landing at Edwards Air Force Base?
- A. The energy of the shuttle is converted into heat that is then radiated away via the heat shield.  
B. The energy of the shuttle is converted into chemical energy that is stored for future missions.  
C. The energy is used to compress gas that is stored in an external fuel tank.  
D. The energy is left behind in orbit as the shuttle returns to the Earth.  
E. The shuttle's energy is stored on the space station for future missions.
- \_\_\_ 42. A force is applied to an airtight plunger so as to rapidly compress the air in a glass cylinder thus igniting a small piece of tissue paper. The tissue paper catches fire because \_\_\_\_\_.
- A. the molecules of the gas will be moving slower than they were before doing the work  
B. the gas will heat up as it does this work  
C. the plunger does work on the gas increasing the average kinetic energy and thus the temperature of the air in the cylinder  
D. the gas will cool off as the internal energy of the gas is converted into work  
E. the molecules of the gas will move in only one direction
- \_\_\_ 43. Which of the following would be an example of elastic potential energy?
- A. a pogo stick      B. a bullet fired from a gun  
C. water from behind a dam turning an electric generator  
D. a fire burning in a fire place      E. a hammer driving a nail into a piece of wood
- \_\_\_ 44. The ideal mechanical advantage of a simple machine is usually greater than the actual mechanical advantage of a simple machine because \_\_\_\_\_.
- A. some of the force put into a simple machine is wasted overcoming the force of friction  
B. simple machines generally increase both distance and force  
C. simple machines are made of few moving parts  
D. simple machines increase force at the expense of distance  
E. simple machines work best when used in reverse

## CONCEPTUAL ENERGY CONSERVATION REVIEW

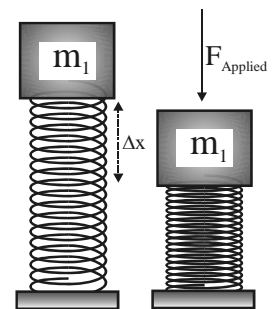
A satellite is orbiting the Earth in a very elliptical orbit as shown in the diagram to the right.

- \_\_\_ 45. When the satellite is at location A the satellite will \_\_\_\_\_.
- be moving faster than at point B since its gravitational energy is less at point A than at point B while its kinetic energy is more
  - have more total energy than it would have at point B because the attraction of the Earth does work on the satellite
  - be moving more slowly than at point B due to the increase in gravitational potential energy
  - be moving with the same speed as at point B because total energy is always conserved in a closed system
  - have less total energy than it would have at point B because the gravitational energy decreases with distance from the Earth



A mass is compressed on top of a vertical spring by an applied force F. The mass is then released and is allowed to be thrown upward.

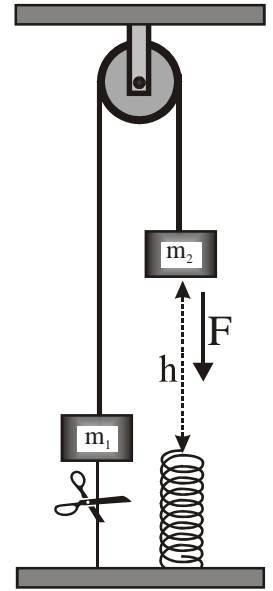
- \_\_\_ 46. What kinds of energy will the system contain while the mass is compressed against the spring?
- KE
  - GPE
  - EPE
  - KE & GPE
  - EPE & KE
  - EPE & GPE
  - EPE & GPE & KE
- \_\_\_ 47. What kinds of energy will the system contain just as the mass loses contact with the end of the spring?
- KE
  - GPE
  - EPE
  - KE & GPE
  - EPE & KE
  - EPE & GPE
  - EPE & GPE & KE
- \_\_\_ 48. What kinds of energy will the system contain just as this mass reaches the highest point?
- KE
  - GPE
  - EPE
  - KE & GPE
  - EPE & KE
  - EPE & GPE
  - EPE & GPE & KE
- \_\_\_ 49. Which of the following equations will properly relate the energy of the system when the mass is compressed against the spring with the energy of the system **just as** the mass loses contact with the spring?
- $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$
  - $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$
  - $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$
  - $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$
  - $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$
  - $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v^2$



- \_\_\_ 50. Which of the following equations will properly relate the energy of the system when the mass is compressed against the spring with the energy of the system when the mass reaches the highest point?
- $\frac{1}{2} \cdot m \cdot v^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$
  - $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$
  - $m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$
  - $\frac{1}{2} \cdot m \cdot v^2 = \frac{1}{2} \cdot k \cdot \Delta x^2 + m \cdot g \cdot h$
  - $\frac{1}{2} \cdot m \cdot v^2 + m \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$
  - $m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v^2$

## CONCEPTUAL ENERGY CONSERVATION REVIEW

Consider an Atwood machine as shown to the right. A mass  $m_1 = 6.0$  kg is attached to a string which is hung over a pulley. The other end of the string is attached to a mass  $m_2 = 4.0$  kg. Mass  $m_1$  is, in addition, attached to the floor with a second string. At  $t = 0$  the string is cut and then this system accelerates until  $m_2$  comes into contact with a spring and compresses the spring until the system momentarily comes to rest. Mass  $m_2$  is initially  $h$  above the top of the spring while  $m_1$  is initially level with the top of the uncompressed spring.



- \_\_\_ 51. What kinds of energy will be present in this system immediately before the lower string is cut?
- A. GPE                      C. EPE                      D. KE & GPE  
E. EPE & KE              F. EPE & GPE              G. EPE & GPE & KE
- \_\_\_ 52. What kinds of energy will be present in this system at the moment that  $m_2$  reaches but has not yet touched the spring?
- A. GPE                      C. EPE                      D. KE & GPE  
E. EPE & KE              F. EPE & GPE              G. EPE & GPE & KE
- \_\_\_ 53. What kinds of energy will be present in this system when mass  $m_2$  briefly comes to rest against the spring?
- A. GPE                      C. EPE                      D. KE & GPE  
E. EPE & KE              F. EPE & GPE              G. EPE & GPE & KE
- \_\_\_ 54. Which of the following equations will properly relate the energy of the system from just **before** the string has been cut and when the mass reaches but has not yet touched the spring?
- A.  $\frac{1}{2} \cdot m_2 \cdot v_0^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$                       B.  $\frac{1}{2} \cdot m \cdot v_f^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
C.  $m_1 \cdot g \cdot \Delta x + m_2 \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2 + m_1 \cdot g \cdot h - m_2 \cdot g \cdot \Delta x$                       D.  $m_2 \cdot g \cdot h = \frac{1}{2} \cdot [m_1 + m_2] \cdot v_f^2 + m_1 \cdot g \cdot h$   
E.  $\frac{1}{2} \cdot m_2 \cdot v^2 + m_1 \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2 + [m_1 + m_2] \cdot g \cdot \Delta x$                       F.  $[m_1 + m_2] \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$
- \_\_\_ 55. Which of the following equations will properly relate the energy of the system from just **before** the string has been cut and when the mass momentarily comes to rest against the spring?
- A.  $\frac{1}{2} \cdot m_2 \cdot v_0^2 + \frac{1}{2} \cdot k \cdot \Delta x^2 = m \cdot g \cdot h$                       B.  $\frac{1}{2} \cdot m \cdot v_f^2 = \frac{1}{2} \cdot k \cdot \Delta x^2$   
C.  $m_1 \cdot g \cdot \Delta x + m_2 \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2 + m_1 \cdot g \cdot h - m_2 \cdot g \cdot \Delta x$                       D.  $m_2 \cdot g \cdot h = \frac{1}{2} \cdot [m_1 + m_2] \cdot v_f^2 + m_1 \cdot g \cdot h$   
E.  $\frac{1}{2} \cdot m_2 \cdot v^2 + m_1 \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2 + [m_1 + m_2] \cdot g \cdot \Delta x$                       F.  $[m_1 + m_2] \cdot g \cdot h = \frac{1}{2} \cdot k \cdot \Delta x^2$