You are welcome to do this quiz together with 1 or 2 neighbors sitting nearby. However, each student has to fill out her/his individual scoring form and provide the answers for her/his individualized quiz form. Please fill out carefully your name, PID and the CODE of your quiz on the scoring form NOW. The quiz cannot be graded without the CODE.

Choose only one answer for each problem.

1. [2pt] Suppose you find that the sum of kinetic and potential (U=mgx+y) energy of an object is reduced after some time. What can you conclude?
   A) A force other than gravity must have done positive work on the object
   B) A force other than gravity must have done negative work on the object
   C) Positive work has been done on the object by gravity
   D) Negative work has been done on the object by gravity
   E) This cannot happen because energy is conserved

   \[
   K_f + U_f = K_i + U_i + W
   \]

   \( \Rightarrow \) if \( K + U \) is reduced \( W < 0 \) \( \Rightarrow \) other force than gravity must have done work (gravity is included in \( U \))

2. [2pt] Presume only gravity acts on an object that has a kinetic energy of 1000 J. If the velocity of the object increases by a factor of 2, the potential energy of the object
   A) increases by 2000 J
   B) increases by 4000 J
   C) decreases by 3000 J
   D) decreases by 1000 J
   E) decreases by 4000 J

   \[
   K_i = \frac{1}{2} m v_i^2 = 1000 J
   \]

   \[
   K_f = \frac{1}{2} m (2v_i)^2 = 4000 J
   \]

   \[
   \Delta K = +3000 J \quad \Delta U = -3000 J
   \]

3. [2pt] What does it mean if the potential energy of an object is negative?
   A) Positive work has been done on the object to bring it to its current position
   B) Negative work has been done on the object to bring it to its current position
   C) You have chosen your reference (zero) point for potential energy below its current position
   D) The potential energy is always positive
   E) You have chosen your reference (zero) point for potential energy above its current position

4. [2pt] Two blocks, both of mass 2.0 kg, are dropped from the windows of a building. Block A is dropped from a window on the 3rd floor while block B is dropped from a window on the 6th floor. The instant before block B strikes the ground its kinetic energy is \( \frac{U}{g} \) as much as the kinetic energy of block A the instant before it strikes the ground.
   A) four times as much
   B) three times as much
   C) nine times as much
   D) twice as much
   E) the same

   \[
   U = mgh \quad \text{(ground in h=0)}
   \]

   \( \text{then } K_{\text{before strike}} = U_{\text{initial}} \)

   \( \text{U initial in twice as large for block B} \)

   \( \text{therefore } K_{\text{before strike B}} \text{ is also twice as large} \)

5. [2pt] Now assume the blocks are thrown out of their respective windows at the same time. What is the kinetic energy of block B compared to the kinetic energy of block A at the time just before block A hits the ground?
   A) two times larger
   B) half
   C) quarter
   D) four times larger
   E) the same

   \[
   \text{again both blocks fall the same distance, therefore their change in } U \text{ is the same and therefore their } K \text{ is the same as well}
   \]