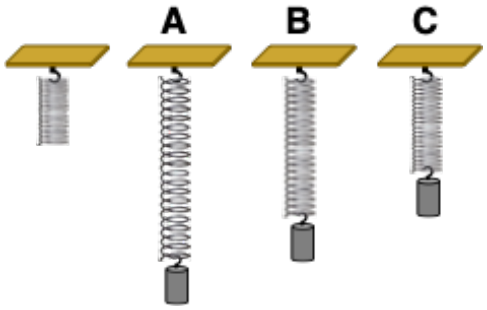
Energy of a Vibrating Mass on a Spring

Activity 1 KE, PE, and TME
Question Group 1
Question 1



A spring is attached to a ceiling hook. A mass is attached to the spring and pulled down to position A. It is released from rest and vibrates back and forth between positions A and C. Position B is the equilibrium position. Assuming no damping, what changes would be observed as the mass vibrates from locations **A to B**?

The **kinetic energy** would …

a. increase b. decrease c. first increase and then decrease

d. first decrease and then increase e. remain unchanged

The **gravitational potential energy** would …

a. increase b. decrease c. first increase and then decrease

d. first decrease and then increase e. remain unchanged

The **elastic potential energy** would …

a. increase b. decrease c. first increase and then decrease

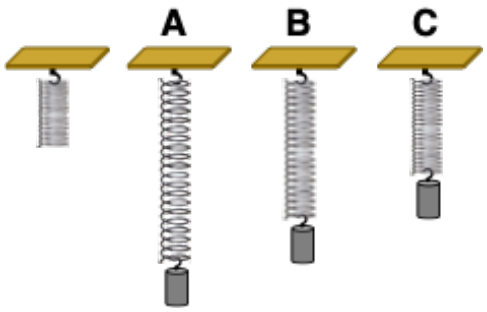
d. first decrease and then increase e. remain unchanged

The **total mechanical energy** would …

a. increase b. decrease c. first increase and then decrease

d. first decrease and then increase e. remain unchanged

Question 2



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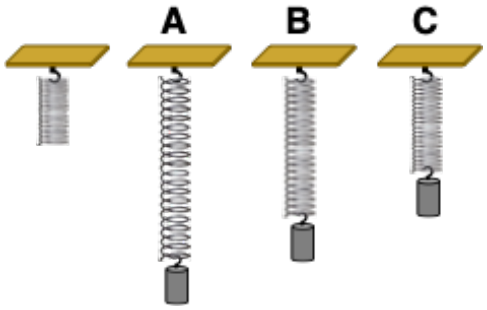
Question Group 2
Question 3



A spring is attached to a ceiling hook. A mass is attached to the spring and pulled down to position A. It is released from rest and vibrates back and forth between positions A and C. Position B is the equilibrium position. Assuming no damping, what changes would be observed as the mass vibrates from locations **C to B**?

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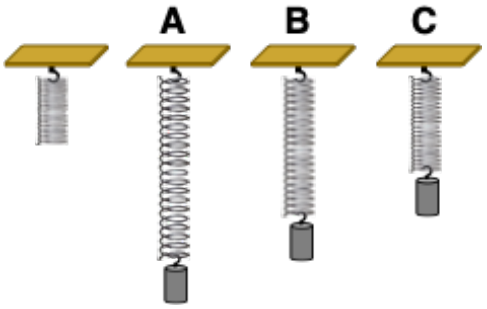
Question 4



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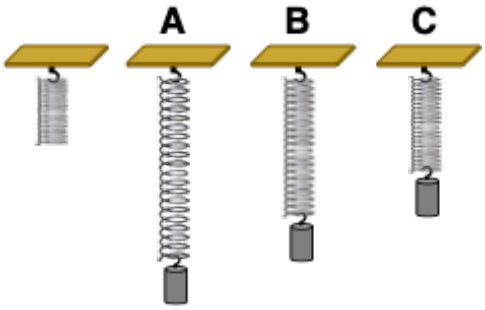
Question Group 3
Question 5



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The **gravitational potential energy** would …

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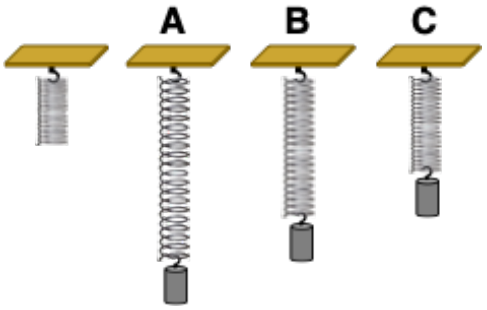
Question 6



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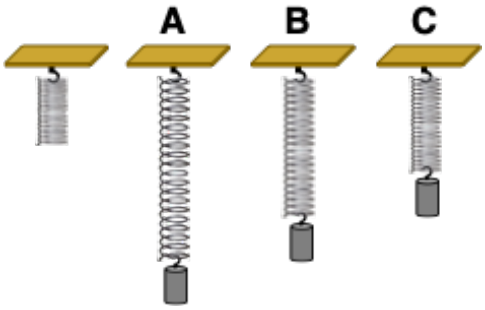
Question Group 4
Question 7



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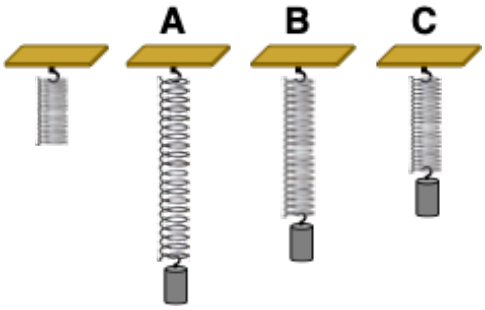
Question 8



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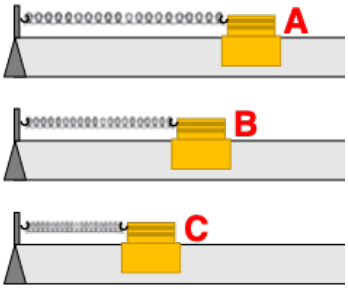
Question Group 5
Question 9



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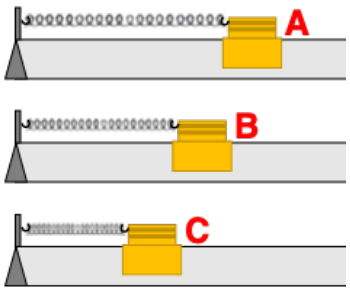
Question 10



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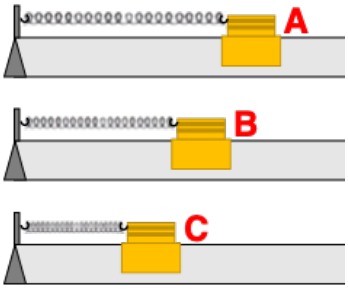
Question 11



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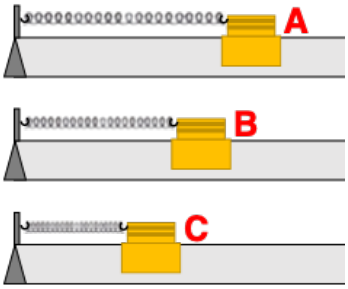
Question 12



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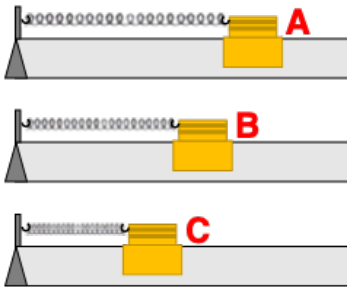
Question Group 6
Question 13



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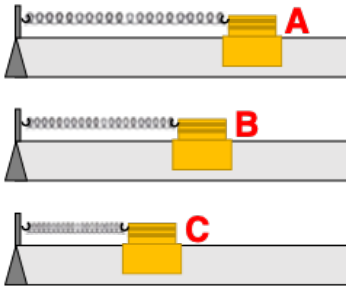
Question 14



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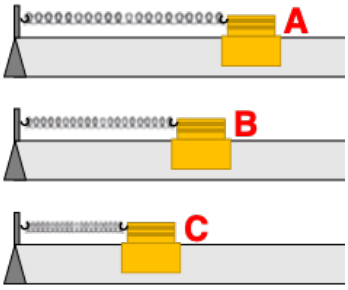
Question 15



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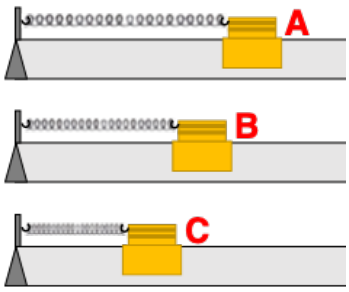
Question 16



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The **elastic potential energy** would …

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The **total mechanical energy** would …

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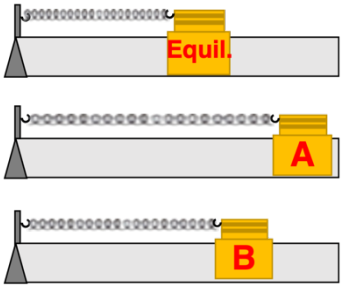
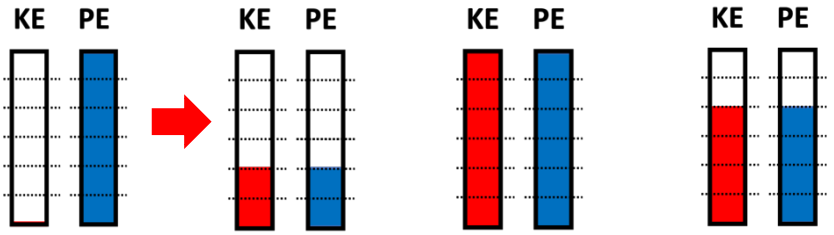
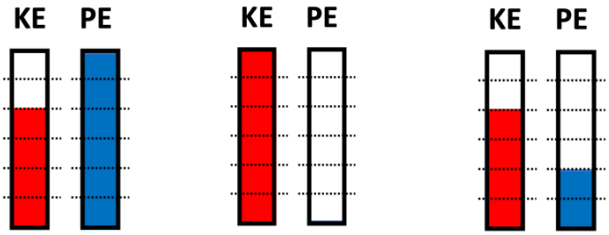
Activity 2 Energy Bar Charts
Question Group 7
Question 17

An air track glider is attached to a spring. Positions A and B are two positions along its back-and-forth path. The energy bar chart for A is shown below. Identify the co rrect energy bar chart for position B.

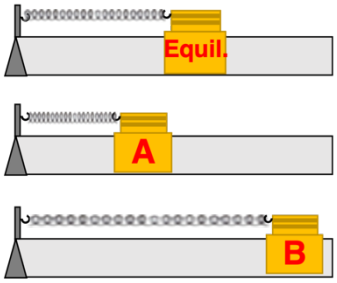


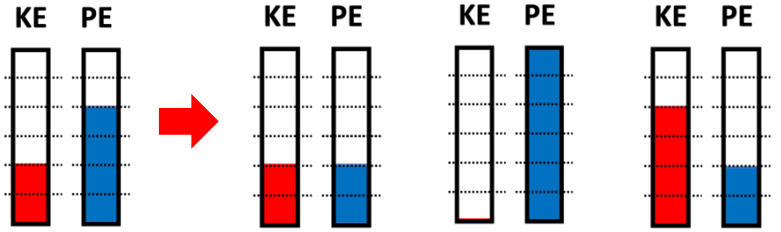


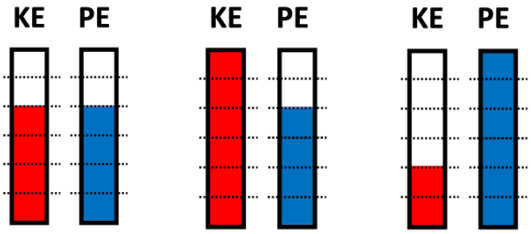


Question Group 8
Question 18

An air track glider is attached to a spring. Positions A and B are two positions along its back-and-forth path. The energy bar chart for A is shown below. Identify the correct energy bar chart for position B.

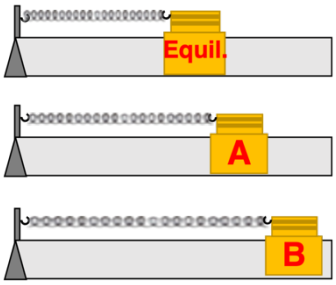


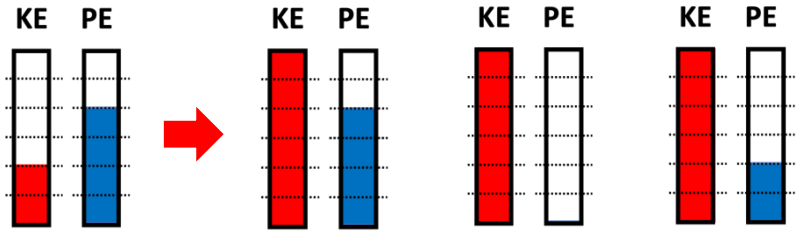


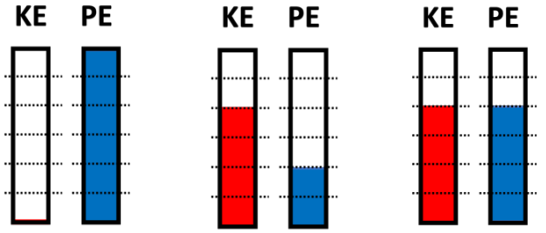


Question Group 9
Question 19

An air track glider is attached to a spring. Positions A and B are two positions along its back-and-forth path. The energy bar chart for A is shown below. Identify the correct energy bar chart for position B.

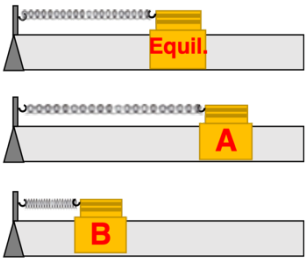


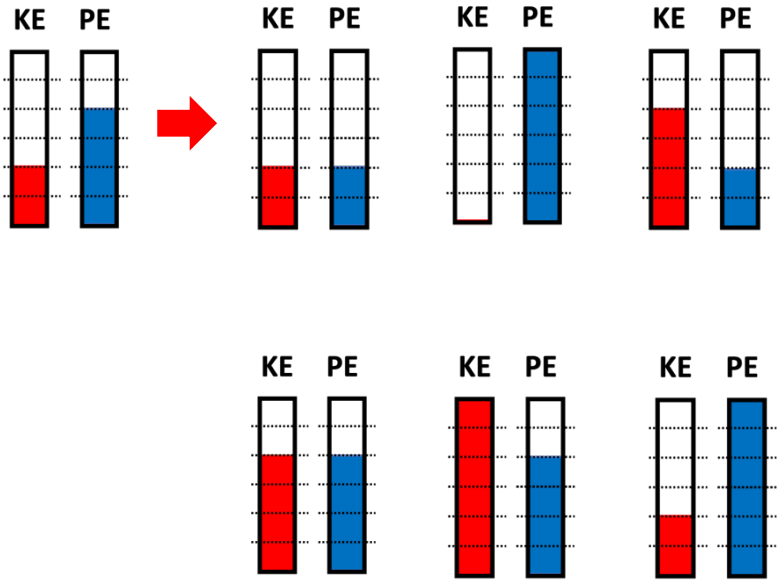




Question Group 10
Question 20

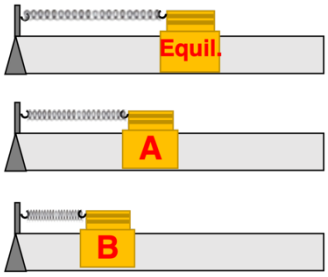
An air track glider is attached to a spring. Positions A and B are two positions along its back-and-forth path. The energy bar chart for A is shown below. Identify the correct energy bar chart for position B.

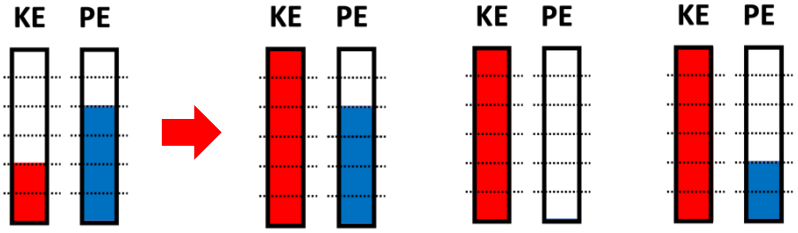


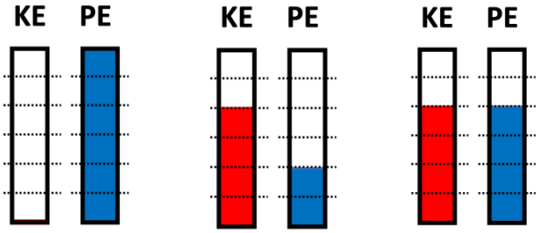


Question Group 11
Question 21

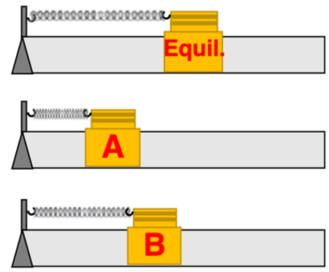
An air track glider is attached to a spring. Positions A and B are two positions along its back-and-forth path. The energy bar chart for A is shown below. Identify the correct energy bar chart for position B.

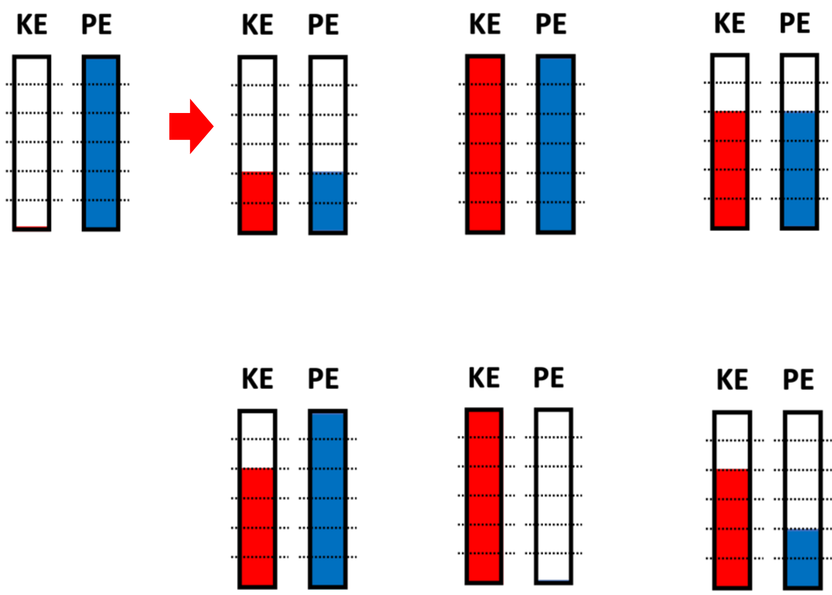




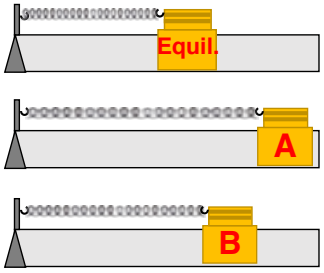


Question Group 12
Question 22
An air track glider is attached to a spring. Positions A and B are two positions along its back-and-forth path. The energy bar chart for A is shown below. Identify the correct energy bar chart for position B.



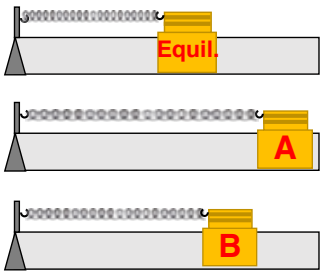


Activity 3: Do It With Numbers (Horizontal)
Question Group 13
Question 23
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 12 J and the KE is 0 J. Determine the energy values at location B.



PE = 3 J	**PE = 3 J**	**PE = 0 J**
KE = 3 J	**KE = 9 J**	**KE = 12 J**

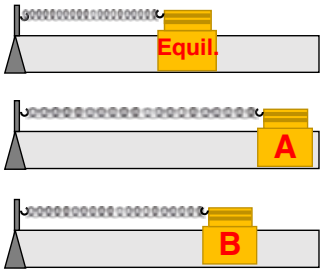
Question 24
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 12 J and the KE is 0 J. Determine the energy values at location B.



PE = 0 J	**PE = 3 J**	**PE = 3 J**
KE = 12 J	**KE = 3 J**	**KE = 9 J**

Question 25

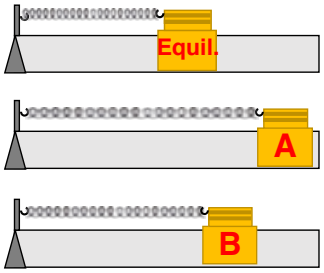
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 12 J and the KE is 0 J. Determine the energy values at location B.



PE = 3 J	**PE = 12 J**	**PE = 3 J**
KE = 9 J	**KE = 0 J**	**KE = 3 J**

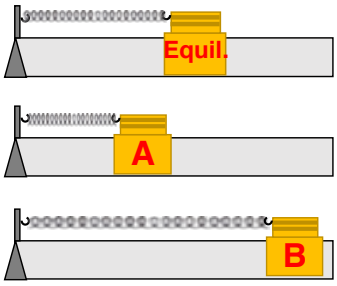
Question 26

A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 12 J and the KE is 0 J. Determine the energy values at location B.



PE = 3 J	**PE = 12 J**	**PE = 3 J**
KE = 3 J	**KE = 0 J**	**KE = 9 J**

Question Group 14
Question 27
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 12 J. Determine the energy values at location B.

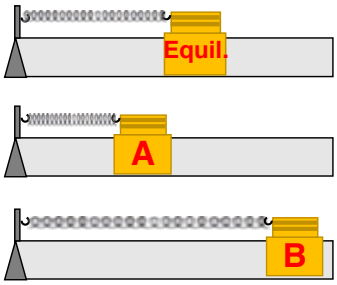


PE = 16 J
KE = 0 J

PE = -12 J
KE = 4 J

PE = 0 J
KE = 16 J

Question 28
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 12 J. Determine the energy values at location B.



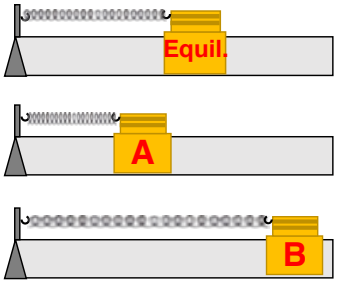
PE = 0 J
KE = 16 J

PE = 16 J
KE = 0 J

PE = -12 J
KE = 4 J

Question 29

A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 12 J. Determine the energy values at location B.



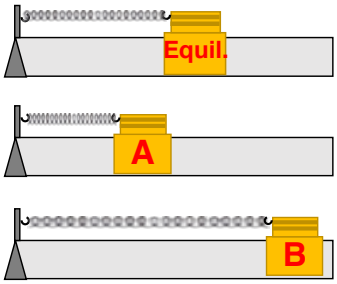
PE = -12 J
KE = 4 J

PE = 0 J
KE = 16 J

PE = 16 J
KE = 0 J

Question 30

A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is AAA J and the KE is BBB J. Determine the energy values at location B.

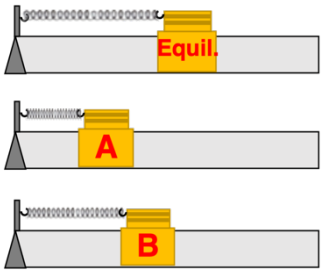


PE = 16 J
KE = 0 J

PE = -12 J
KE = 4 J

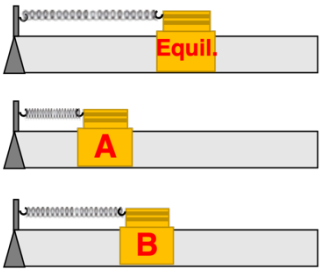
PE = 0 J
KE = 16 J

Question Group 15
Question 31
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 10 J and the KE is 0 J. Determine the energy values at location B.



PE = 3 J	**PE = 3 J**	**PE = 0 J**
KE = 7 J	**KE = 10 J**	**KE = 10 J**

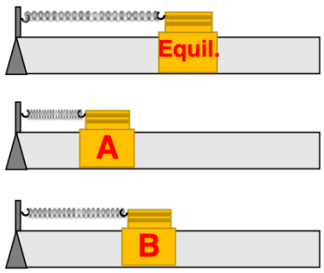
Question 32
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 10 J and the KE is 0 J. Determine the energy values at location B.



PE = 0 J	**PE = 3 J**	**PE = 3 J**
KE = 10 J	**KE = 7 J**	**KE = 10 J**

Question 33

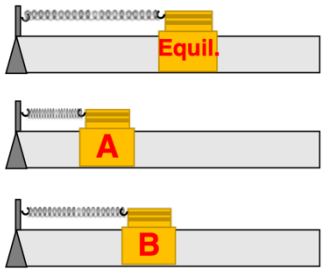
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 10 J and the KE is 0 J. Determine the energy values at location B.



PE = 3 J	**PE = 0 J**	**PE = 3 J**
KE = 10 J	**KE = 10 J**	**KE = 7 J**

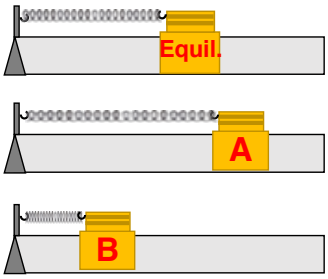
Question 34

A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 10 J and the KE is 0 J. Determine the energy values at location B.



PE = 0 J	**PE = 3 J**	**PE = 3 J**
KE = 10 J	**KE = 10 J**	**KE = 7 J**

Question Group 16
Question 35
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 2 J and the KE is 6 J. Determine the energy values at location B.

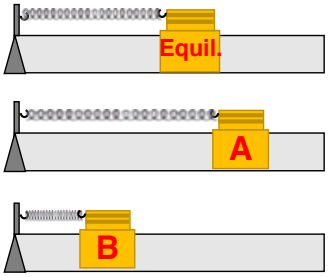


PE = 0 J **KE = 8 J**

PE = -2 J **KE = 6 J**

PE = 8 J **KE = 0 J**

Question 36
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 2 J and the KE is 6 J. Determine the energy values at location B.



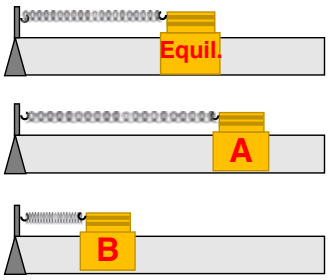
PE = 8 J **KE = 0 J**

PE = 0 J **KE = 8 J**

PE = -2 J **KE = 6 J**

Question 37

A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 2 J and the KE is 6 J. Determine the energy values at location B.



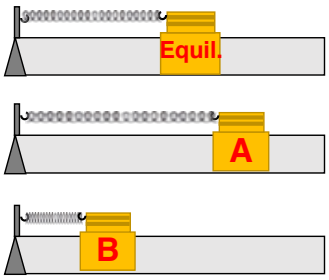
PE = -2 J
KE = 6 J

PE = 8 J
KE = 0 J

PE = 0 J
KE = 8 J

Question 38

A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 2 J and the KE is 6 J. Determine the energy values at location B.

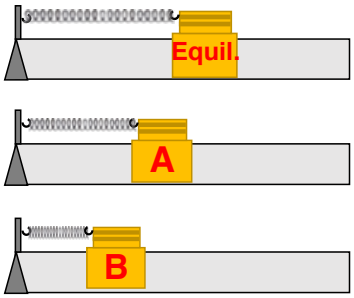


PE = 0 J
KE = 8 J

PE = -2 J
KE = 6 J

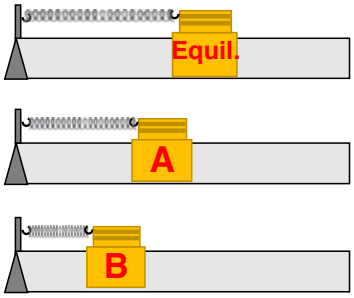
PE = 8 J
KE = 0 J

Question Group 17
Question 39
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 8 J. Determine the energy values at location B.



PE = 12 J	**PE = 0 J**	**PE = 2 J**
KE = 0 J	**KE = 12 J**	**KE = 10 J**

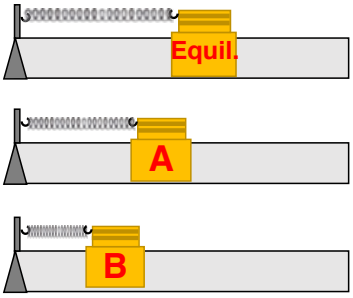
Question 40
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 8 J. Determine the energy values at location B.



PE = 2 J	**PE = 12 J**	**PE = 0 J**
KE = 10 J	**KE = 0 J**	**KE = 12 J**

Question 41

A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 8 J. Determine the energy values at location B.



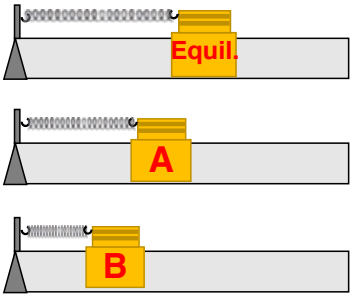
PE = 0 J
KE = 12 J

PE = 2 J
KE = 10 J

PE = 12 J
KE = 0 J

Question 42

A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 8 J. Determine the energy values at location B.

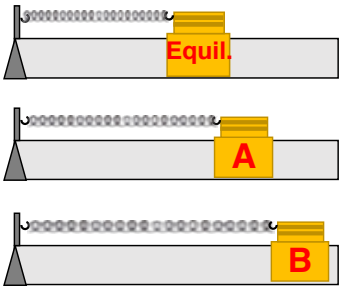


PE = 0 J
KE = 12 J

PE = 12 J
KE = 0 J

PE = 2 J
KE = 10 J

Question Group 18
Question 43
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 8 J. Determine the energy values at location B.

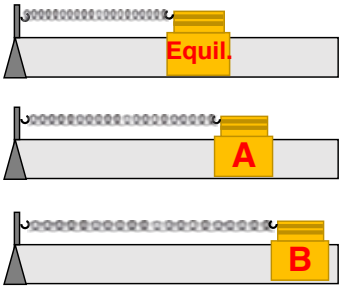


PE = 2 J
KE = 10 J

PE = 12 J
KE = 0 J

PE = 0 J
KE = 12 J

Question 44
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 8 J. Determine the energy values at location B.

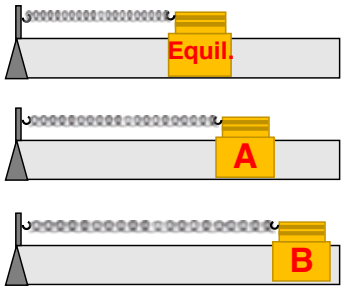


PE = 0 J
KE = 12 J

PE = 2 J
KE = 10 J

PE = 12 J
KE = 0 J

Question 45
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 8 J. Determine the energy values at location B.

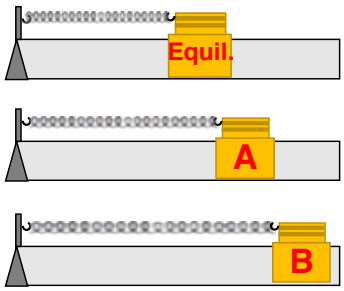


PE = 12 J
KE = 0 J

PE = 0 J
KE = 12 J

PE = 2 J
KE = 10 J

Question 46
A mass is attached to a horizontal spring and vibrating back and forth. At location A, the PE is 4 J and the KE is 8 J. Determine the energy values at location B.



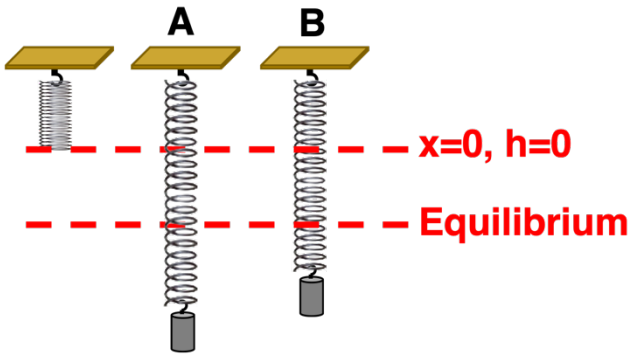
PE = 2 J
KE = 10 J

PE = 0 J
KE = 12 J

PE = 12 J
KE = 0 J

Activity 4 Do It With Numbers (Vertical)
Question Group 19
Question 47

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.200 J, the PE_{spring} is 0.900 J and the KE is 0 J. Determine the energy values at location B.



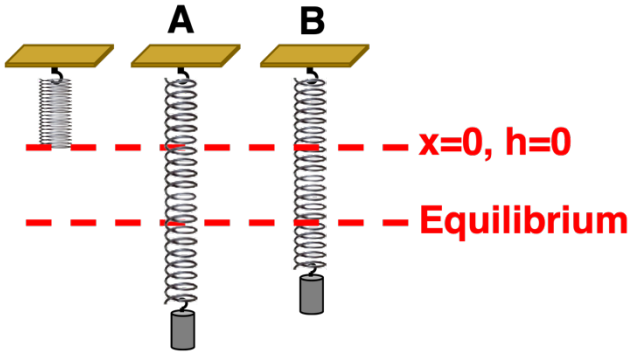
PE_{grav} = -1.000 J **PE_{grav} = -1.400 J** **PE_{grav} = -0.900 J**

PE_{spring} = 0.625 J **PE_{spring} = 0.520 J** **PE_{spring} = 1.100 J**

KE = 0.075 J **KE = 0.580 J** **KE = 0.100 J**

Question 48

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.200 J, the PE_{spring} is 0.900 J and the KE is 0 J. Determine the energy values at location B.



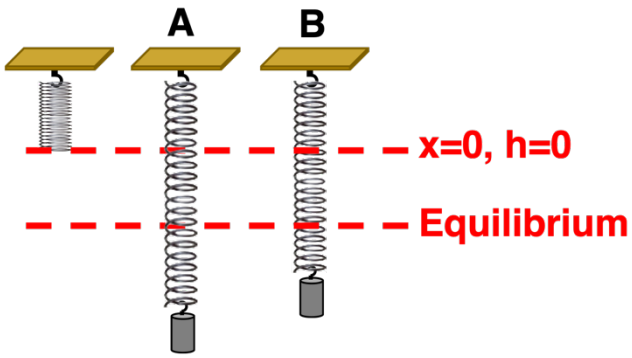
PE_{grav} = -0.900 J **PE_{grav} = -1.000 J** **PE_{grav} = -1.400 J**

PE_{spring} = 1.100 J **PE_{spring} = 0.625 J** **PE_{spring} = 0.520 J**

KE = 0.100 J **KE = 0.075 J** **KE = 0.580 J**

Question 49

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.200 J, the PE_{spring} is 0.900 J and the KE is 0 J. Determine the energy values at location B.



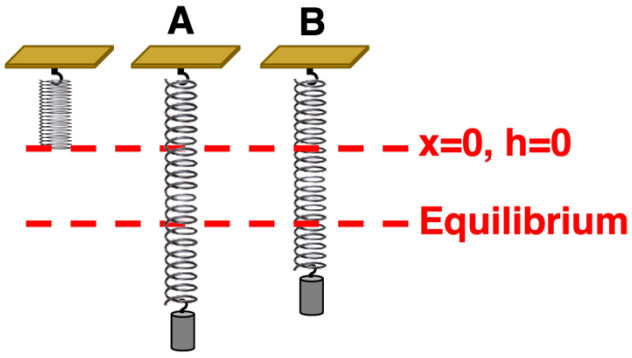
PE_{grav} = -1.400 J
PE_{spring} = 0.520 J
KE = 0.580 J

PE_{grav} = -0.900 J
PE_{spring} = 1.100 J
KE = 0.100 J

PE_{grav} = -1.000 J
PE_{spring} = 0.625 J
KE = 0.075 J

Question 50

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.200 J, the PE_{spring} is 0.900 J and the KE is 0 J. Determine the energy values at location B.

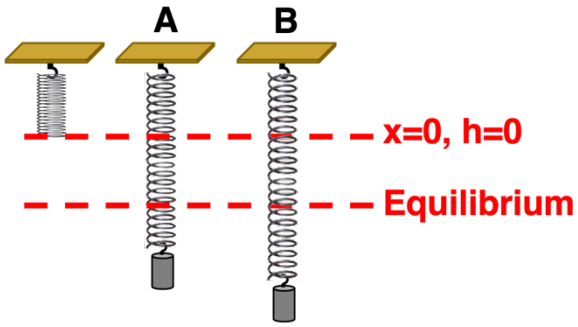


PE_{grav} = -0.900 J
PE_{spring} = 1.100 J
KE = 0.100 J

PE_{grav} = -1.400 J
PE_{spring} = 0.520 J
KE = 0.580 J

PE_{grav} = -1.000 J
PE_{spring} = 0.625 J
KE = 0.075 J

Question Group 20
Question 51
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -0.800 J, the PE_{spring} is 0.800 J and the KE is 0.600 J. Determine the energy values at location B.

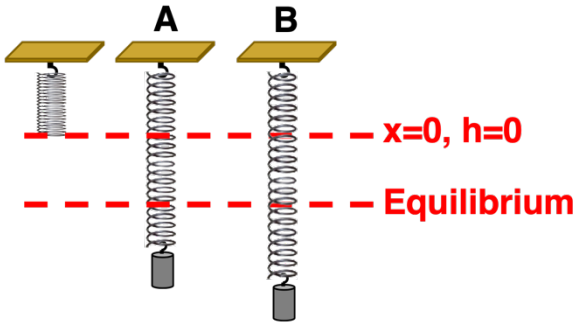


PE_{grav} = -1.200 J
PE_{spring} = 1.800 J
KE = 0 J

PE_{grav} = -0.600 J
PE_{spring} = 1.000 J
KE = 0.200 J

PE_{grav} = -1.200 J
PE_{spring} = 1.000 J
KE = 0.800 J

Question 52
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -0.800 J, the PE_{spring} is 0.800 J and the KE is 0.600 J. Determine the energy values at location B.



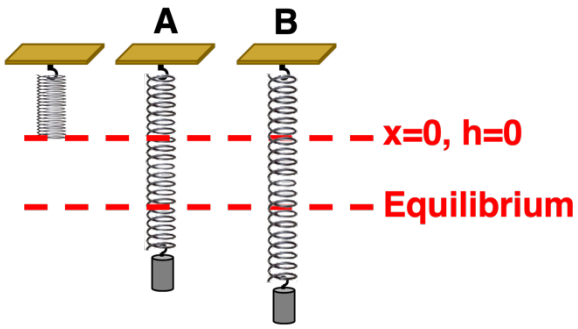
PE_{grav} = -1.200 J
PE_{spring} = 1.000 J
KE = 0.800 J

PE_{grav} = -1.200 J
PE_{spring} = 1.800 J
KE = 0 J

PE_{grav} = -0.600 J
PE_{spring} = 1.000 J
KE = 0.200 J

Question 53

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -0.800 J, the PE_{spring} is 0.800 J and the KE is 0.600 J. Determine the energy values at location B.



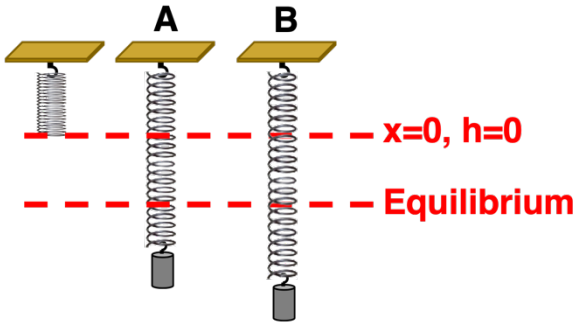
PE_{grav} = -0.600 J
PE_{spring} = 1.000 J
KE = 0.200 J

PE_{grav} = -1.200 J
PE_{spring} = 1.000 J
KE = 0.800 J

PE_{grav} = -1.200 J
PE_{spring} = 1.800 J
KE = 0 J

Question 54

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -0.800 J, the PE_{spring} is 0.800 J and the KE is 0.600 J. Determine the energy values at location B.

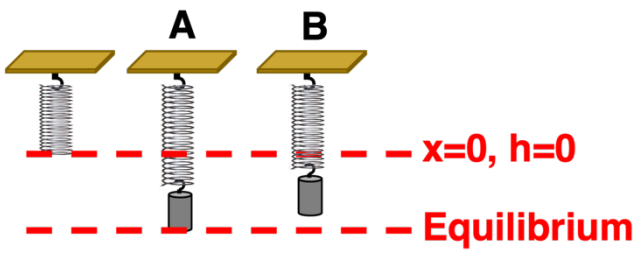


PE_{grav} = -1.200 J
PE_{spring} = 1.800 J
KE = 0 J

PE_{grav} = -1.200 J
PE_{spring} = 1.000 J
KE = 0.800 J

PE_{grav} = -0.600 J
PE_{spring} = 1.000 J
KE = 0.200 J

Question Group 21
Question 55
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -0.600 J, the PE_{spring} is 0.225 J and the KE is 0.075 J. Determine the energy values at location B.

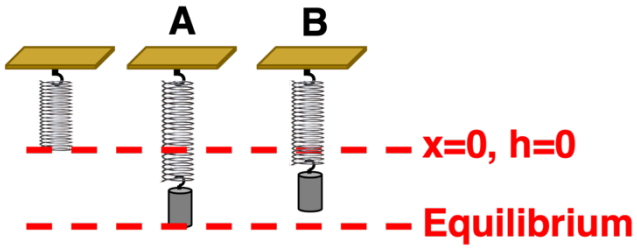


PE_{grav} = -0.400 J
PE_{spring} = 0.100 J
KE = 0 J

PE_{grav} = -0.700 J
PE_{spring} = 0.300 J
KE = 0.100 J

PE_{grav} = -0.650 J
PE_{spring} = 0.350 J
KE = 0 J

Question 56
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -0.600 J, the PE_{spring} is 0.225 J and the KE is 0.075 J. Determine the energy values at location B.



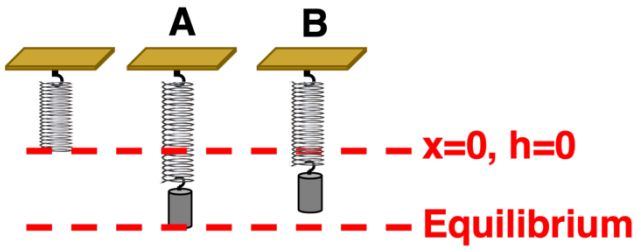
PE_{grav} = -0.650 J
PE_{spring} = 0.350 J
KE = 0 J

PE_{grav} = -0.400 J
PE_{spring} = 0.100 J
KE = 0 J

PE_{grav} = -0.700 J
PE_{spring} = 0.300 J
KE = 0.100 J

Question 57

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -0.600 J, the PE_{spring} is 0.225 J and the KE is 0.075 J. Determine the energy values at location B.



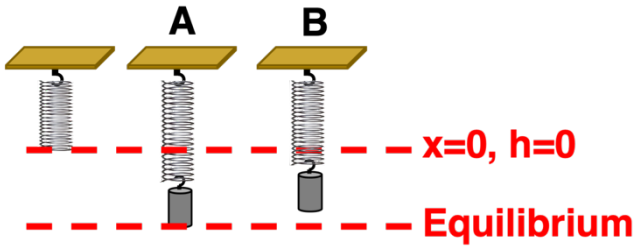
PE_{grav} = -0.700 J
PE_{spring} = 0.300 J
KE = 0.100 J

PE_{grav} = -0.650 J
PE_{spring} = 0.350 J
KE = 0 J

PE_{grav} = -0.400 J
PE_{spring} = 0.100 J
KE = 0 J

Question 58

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -0.600 J, the PE_{spring} is 0.225 J and the KE is 0.075 J. Determine the energy values at location B.

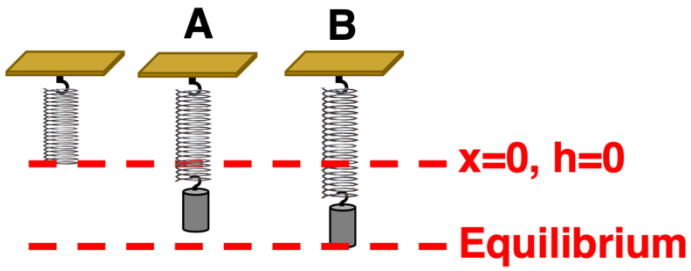


PE_{grav} = -0.700 J
PE_{spring} = 0.300 J
KE = 0.100 J

PE_{grav} = -0.400 J
PE_{spring} = 0.100 J
KE = 0 J

PE_{grav} = -0.650 J
PE_{spring} = 0.350 J
KE = 0 J

Question Group 22
Question 59
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.50 J, the PE_{spring} is 0.45 J and the KE is 0 J. Determine the energy values at location B.

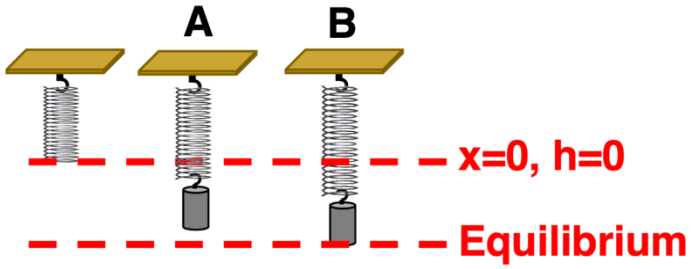


PE_{grav} = -2.00 J
PE_{spring} = 0.80 J
KE = 0.15 J

PE_{grav} = -1.00 J
PE_{spring} = 0.25 J
KE = 0.70 J

PE_{grav} = -3.00 J
PE_{spring} = 0.20 J
KE = 1.75 J

Question 60
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.50 J, the PE_{spring} is 0.45 J and the KE is 0 J. Determine the energy values at location B.



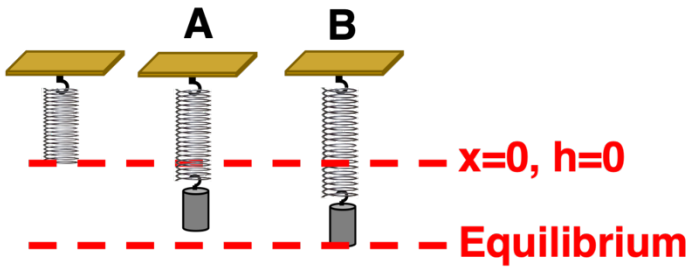
PE_{grav} = -3.00 J
PE_{spring} = 0.20 J
KE = 1.75 J

PE_{grav} = -2.00 J
PE_{spring} = 0.80 J
KE = 0.15 J

PE_{grav} = -1.00 J
PE_{spring} = 0.25 J
KE = 0.70 J

Question 61

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.50 J, the PE_{spring} is 0.45 J and the KE is 0 J. Determine the energy values at location B.



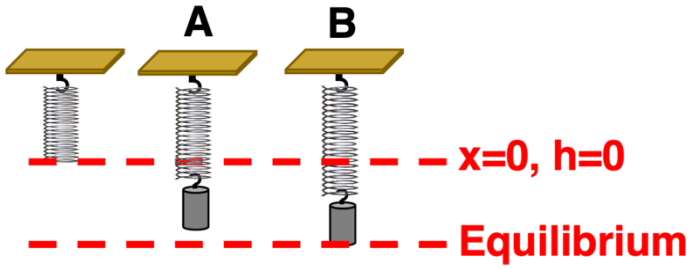
PE_{grav} = -1.00 J
PE_{spring} = 0.25 J
KE = 0.70 J

PE_{grav} = -3.00 J
PE_{spring} = 0.20 J
KE = 1.75 J

PE_{grav} = -2.00 J
PE_{spring} = 0.80 J
KE = 0.15 J

Question 62

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.50 J, the PE_{spring} is 0.45 J and the KE is 0 J. Determine the energy values at location B.

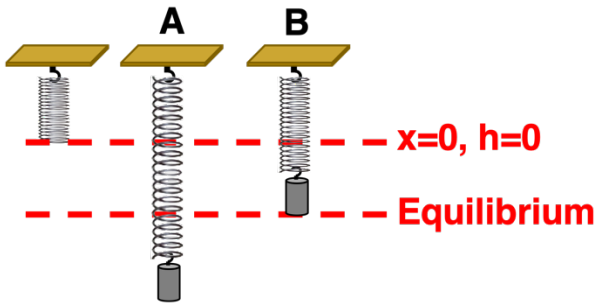


PE_{grav} = -2.00 J
PE_{spring} = 0.80 J
KE = 0.15 J

PE_{grav} = -3.00 J
PE_{spring} = 0.20 J
KE = 1.75 J

PE_{grav} = -1.00 J
PE_{spring} = 0.25 J
KE = 0.70 J

Question Group 23
Question 63
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -4.00 J, the PE_{spring} is 3.20 J and the KE is 0 J. Determine the energy values at location B.

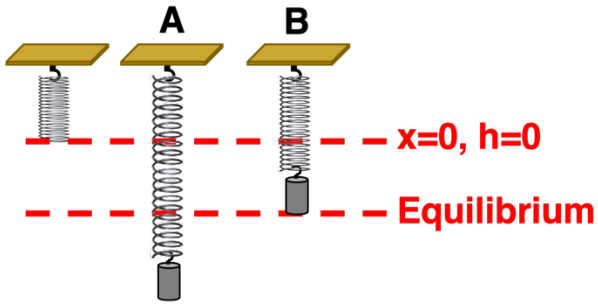


PE_{grav} = -1.75 J
PE_{spring} = 0.61 J
KE = 0.34 J

PE_{grav} = -5.00 J
PE_{spring} = 2.00 J
KE = 2.20 J

PE_{grav} = 2.20 J
PE_{spring} = -3.80 J
KE = 0.80 J

Question 64
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -4.00 J, the PE_{spring} is 3.20 J and the KE is 0 J. Determine the energy values at location B.



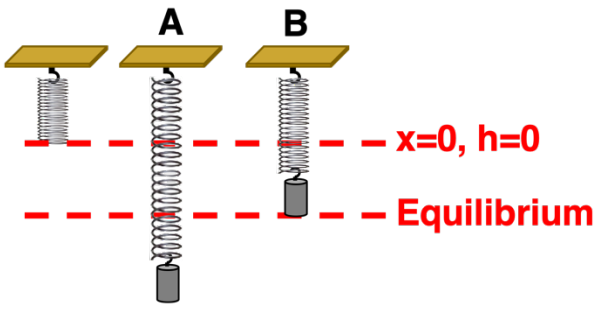
PE_{grav} = 2.20 J
PE_{spring} = -3.80 J
KE = 0.80 J

PE_{grav} = -1.75 J
PE_{spring} = 0.61 J
KE = 0.34 J

PE_{grav} = -5.00 J
PE_{spring} = 2.00 J
KE = 2.20 J

Question 65

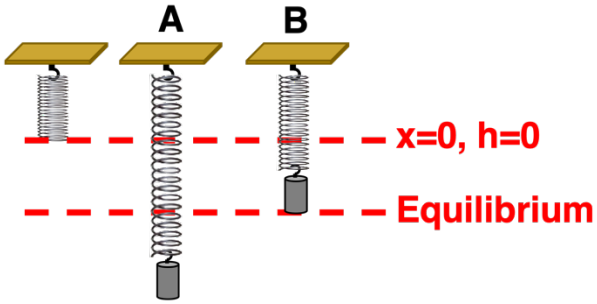
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -4.00 J, the PE_{spring} is 3.20 J and the KE is 0 J. Determine the energy values at location B.



PE_{grav} = -5.00 J	**PE_{grav} = 2.20 J**	**PE_{grav} = -1.75 J**
PE_{spring} = 2.00 J	**PE_{spring} = -3.80 J**	**PE_{spring} = 0.61 J**
KE = 2.20 J	**KE = 0.80 J**	**KE = 0.34 J**

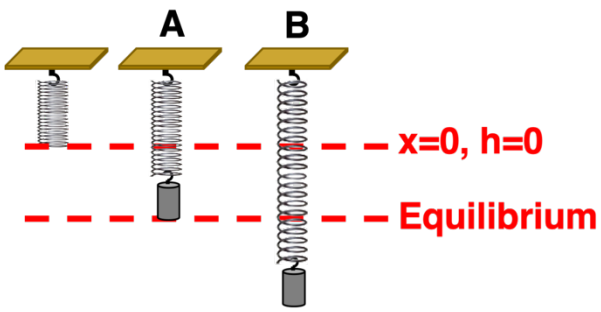
Question 66

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -4.00 J, the PE_{spring} is 3.20 J and the KE is 0 J. Determine the energy values at location B.



PE_{grav} = 2.20 J	**PE_{grav} = -5.00 J**	**PE_{grav} = -1.75 J**
PE_{spring} = -3.80 J	**PE_{spring} = 2.00 J**	**PE_{spring} = 0.61 J**
KE = 0.80 J	**KE = 2.20 J**	**KE = 0.34 J**

Question Group 24
Question 67
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.2 J, the PE_{spring} is 0.45 J and the KE is 0.15 J. Determine the energy values at location B.

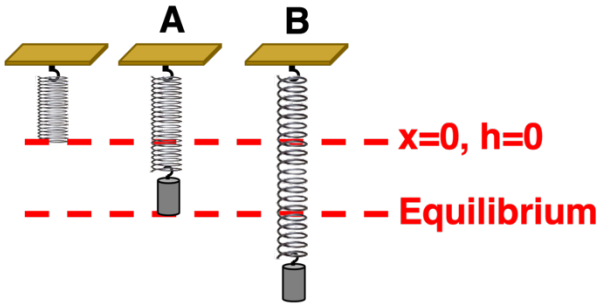


PE_{grav} = -2.00 J
PE_{spring} = 1.25 J
KE = 0.15 J

PE_{grav} = -0.80 J
PE_{spring} = 0.20 J
KE = 0 J

PE_{grav} = -1.60 J
PE_{spring} = 0.20 J
KE = 0.80 J

Question 68
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.2 J, the PE_{spring} is 0.45 J and the KE is 0.15 J. Determine the energy values at location B.



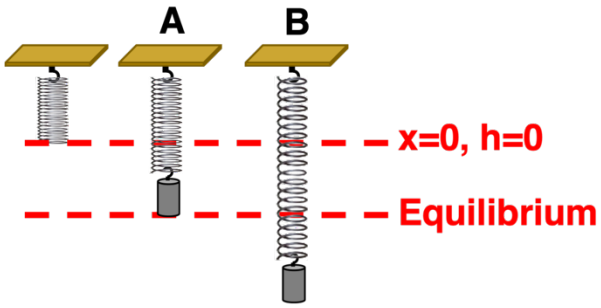
PE_{grav} = -1.60 J
PE_{spring} = 0.20 J
KE = 0.80 J

PE_{grav} = -2.00 J
PE_{spring} = 1.25 J
KE = 0.15 J

PE_{grav} = -0.80 J
PE_{spring} = 0.20 J
KE = 0 J

Question 69

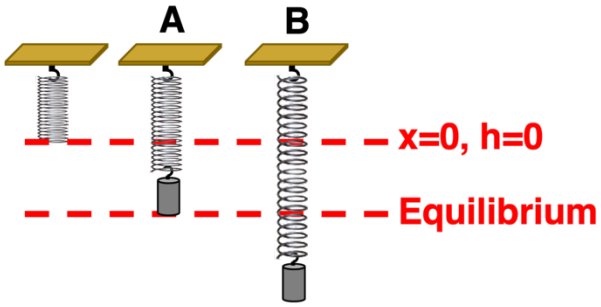
A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.2 J, the PE_{spring} is 0.45 J and the KE is 0.15 J. Determine the energy values at location B.



PE_{grav} = -0.80 J	**PE_{grav} = -1.60 J**	**PE_{grav} = -2.00 J**
PE_{spring} = 0.20 J	**PE_{spring} = 0.20 J**	**PE_{spring} = 1.25 J**
KE = 0 J	**KE = 0.80 J**	**KE = 0.15 J**

Question 70

A mass is attached to a vertical spring and vibrating up and down. At location A, the PE_{grav} is -1.2 J, the PE_{spring} is 0.45 J and the KE is 0.15 J. Determine the energy values at location B.



PE_{grav} = -1.60 J	**PE_{grav} = -2.00 J**	**PE_{grav} = -0.80 J**
PE_{spring} = 0.20 J	**PE_{spring} = 1.25 J**	**PE_{spring} = 0.20 J**
KE = 0.80 J	**KE = 0.15 J**	**KE = 0 J**