Name _____

Unit 4: Independent Work Packet

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Skill 28: Types of Energy and Work

1. A 75-kilogram bicyclist coasts down a hill at a constant speed of 12 meters per second. What is the kinetic energy of the bicyclist?

   A) 4.5×10^2 J B) 9.0×10^2 J
   C) 5.4×10^3 J D) 1.1×10^4 J

2. If the speed of a moving object is doubled, the kinetic energy of the object is

   A) halved B) doubled
   C) unchanged D) quadrupled

3. If the direction of a moving car changes and its speed remains constant, which quantity must remain the same?

   A) velocity B) momentum
   C) displacement D) kinetic energy

4. As a bullet shot vertically upward rises, the kinetic energy of the bullet

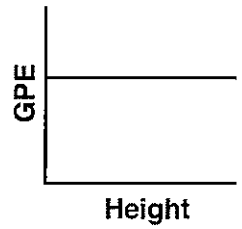
   A) decreases B) increases
   C) remains the same

5. A 4kg sloth climbs slowly from a 3m high limb to a 5m high limb over a period of 12 hours. How much potential energy was gained by the sloth?

   A) 1.8×10^{-3} J B) 8 J
   C) 118 J D) 78.4 J

6. Which graph represents the relationship between the gravitational potential energy *(GPE)* of an object near the surface of Earth and its height above the surface of Earth?

A)



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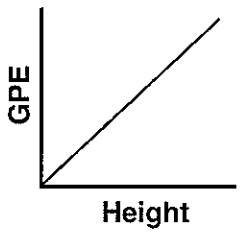

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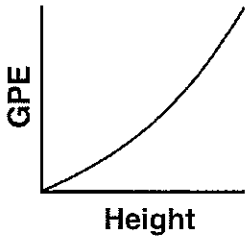

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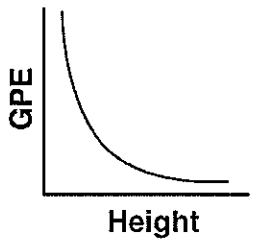


7. Which statement describes the kinetic energy and total mechanical energy of a block as it is pulled at constant speed up an incline?

A) Kinetic energy decreases and total mechanical energy increases.
B) Kinetic energy decreases and total mechanical energy remains the same.
C) Kinetic energy remains the same and total mechanical energy increases.
D) Kinetic energy remains the same and total mechanical energy remains the same.

8. Two students of equal weight go from the first floor to the second floor. The first student uses an elevator and the second student walks up a flight of stairs. Compared to the gravitational potential energy gained by the first student, the gravitational potential energy gained by the second student is

A) less
B) greater
C) the same

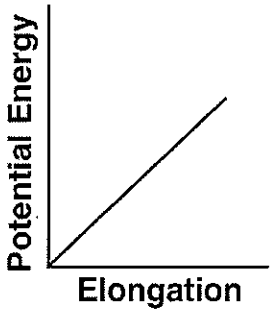
9. An object weighing 15 Newtons is lifted from the ground to a height of 0.22 meter. The increase in the object's gravitational potential energy is approximately

A) 310 J
B) 32 J
C) 3.3 J
D) 0.34 J

10. A spring gains 2.34 joules of elastic potential energy as it is compressed 0.250 meter from its equilibrium position. What is the spring constant of this spring?

A) 9.36 N/m
B) 18.7 N/m
C) 37.4 N/m
D) 74.9 N/m

11. Which graph best represents the relationship between the elastic potential energy stored in a spring and its elongation from equilibrium?

A)


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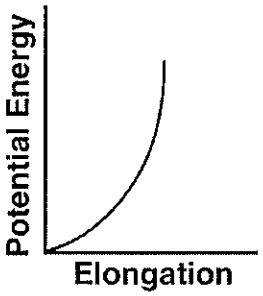

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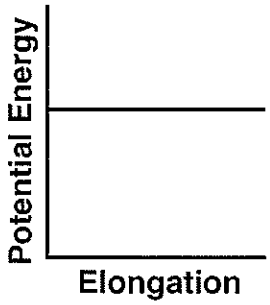

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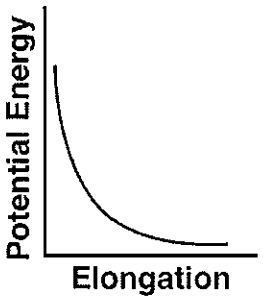


12. A spring with a spring constant of 80. newtons per meter is displaced 0.30 meter from its equilibrium position. The potential energy stored in the spring is

A) 3.6 J B) 7.2 J C) 12 J D) 24 J

13. A student does 300. joules of work pushing a cart 3.0 meters due east and then does 400. joules of work pushing the cart 4.0 meters due north. The total amount of work done by the student is

A) 100. J B) 500. J
C) 700. J D) 2500. J

14. A force of 10. Newtons is used to pull a chest weighing 50. Newtons at uniform speed a distance of 5.0 meters. The work done is

A) 10. joules B) 50. joules
C) 250 joules D) 2,500 joules

15. Which action would require no work to be done on an object?

A) lifting the object from the floor to the ceiling
B) pushing the object along a horizontal floor against a frictional force
C) decreasing the speed of the object until it comes to rest
D) holding the object stationary above the ground

16. A 1.5-kilogram cart initially moves at 2.0 meters per second. It is brought to rest by a constant net force in 0.30 second. What is the magnitude of the net force?

A) 0.40 N B) 0.90 N
C) 10. N D) 15 N

17. A horizontal force of 40 Newtons pushes a block along a level table at a constant speed of 2 meters per second. How much work is done on the block in 6 seconds?

A) 80 J B) 120 J
C) 240 J D) 480 J

18. Which combination of fundamental units can be used to express energy?

A) kg•m/s B) kg•m^2/s
C) kg•m/s^2 D) kg•m^2/s^2

19. A joule is equivalent to a

A) N•m B) N•s C) N/m D) N/s

20. Which term identifies a scalar quantity?

A) displacement B) acceleration
C) velocity D) energy

Skill 29: Work-Energy Theorem

21. How much work is required to lift a 1.0 kilogram mass from 4.0 meters to 40. meters above the surface of Earth?

A) 2.5 J B) 3.6 J
C) 3.6×10^2 J D) 4.0×10^2 J

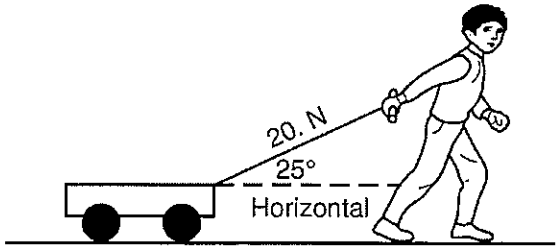
22. The total work done in lifting a typical high school physics textbook a vertical distance of 0.10 meter is approximately

A) 0.15 J B) 1.5 J
C) 15 J D) 150 J

23. The work done in lifting an apple one meter near Earth's surface is approximately

A) 1 J B) 0.01 J
C) 100 J D) 1000 J

24. As shown in the diagram below, a child applies a constant 20.-newton force along the handle of a wagon which makes a 25° angle with the horizontal.



How much work does the child do in moving the wagon a horizontal distance of 4.0 meters?

A) 5.0 J B) 34 J C) 73 J D) 80. J

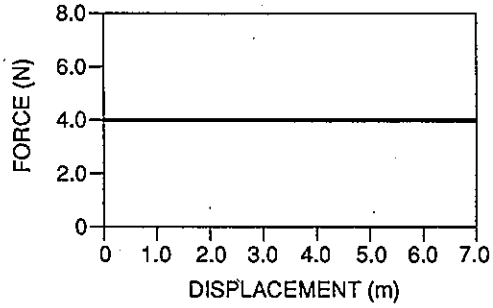
25. Through what vertical distance is a 50.-newton object moved if 250 joules of work is done against the gravitational field of Earth?

A) 2.5 m B) 5.0 m
C) 9.8 m D) 25 m

26. Which combination of units can be used to express work?

A) $\frac{\text{newton} \bullet \text{second}}{\text{meter}}$
B) $\frac{\text{newton} \bullet \text{meter}}{\text{second}}$
C) newton/meter
D) newton • meter

27. The graph below shows the force exerted on a block as a function of the block's displacement in the direction of the force.



How much work did the force do in displacing the block 5.0 meters?

A) 0 J B) 20. J
C) 0.80 J D) 4.0 J

Skill 29: Work-Energy Theorem

28. Which is an SI unit for work done on an object?

A) $\frac{kg \cdot m^2}{s^2}$ B) $\frac{kg \cdot m^2}{s}$

C) $\frac{kg \cdot m}{s}$ D) $\frac{kg \cdot m}{s^2}$

29. When a force moves an object over a rough, horizontal surface at a constant velocity, the work done against friction produces an increase in the object's

A) weight B) momentum
C) potential energy D) internal energy

30. How much work is done on a downhill skier by an average braking force of 9.8×10^2 Newtons to stop her in a distance of 10. meters?

A) 1.0×10^1 J B) 9.8×10^1 J
C) 1.0×10^3 J D) 9.8×10^3 J

31. As the time required to lift a 60-kg. object 6 meters increases, the work required to lift the body

A) decreases
B) increases
C) remains the same

32. A 15.0-kilogram mass is moving at 7.50 meters per second on a horizontal, frictionless surface. What is the total work that must be done on the mass to increase its speed to 11.5 meters per second?

A) 120. J B) 422 J
C) 570. J D) 992 J

33. The work done in accelerating an object along a frictionless horizontal surface is equal to the change in the object's

A) momentum B) velocity
C) potential energy D) kinetic energy

34. Sixteen joules of work was required to lift a 2.0-kilogram object from the floor to a table. How much potential energy was gained by the 2.0-kilogram object?

A) 0.80 joule B) 8.0 joules
C) 16 joules D) 32 joules

35. A person does 100 joules of work in pulling back the string of a bow. What will be the initial speed of a 0.5-kilogram arrow when it is fired from the bow?

A) 20 m/s B) 50 m/s
C) 200 m/s D) 400 m/s

36. An object is lifted at constant speed a distance h above the surface of the Earth in a time t. The total potential energy gained by the object is equal to the

A) average force applied to the object
B) total weight of the object
C) total work done on the object
D) total momentum gained by the object

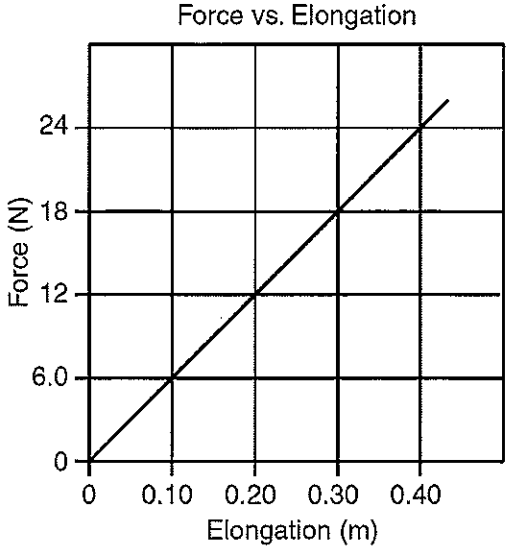
37. Ten joules of work are done in accelerating a 2.0-kilogram mass from rest across a horizontal frictionless table. The total kinetic energy gained by the mass is

A) 3.2 J B) 5.0 J C) 10. J D) 20. J

38. The work done on a slingshot is 40.0 joules to pull back a 0.10-kilogram stone. If the slingshot projects the stone straight up in the air, what is the maximum height to which the stone will rise? [Neglect friction.]

A) 0.41 m B) 41 m
C) 410 m D) 4.1 m

39. The graph below represents the elongation of a spring as a function of the applied force.



How much work must be done to stretch the spring 0.40 meter?

A) 4.8 J B) 6.0 J C) 9.8 J D) 24 J

Skill 30: Rate of Work = Power

40. Which quantity is a measure of the **rate at which work** is done?

A) energy B) power
C) momentum D) velocity

41. The rate at which work is done is measured in

A) Newtons B) joules
C) calories D) watts

42. Which unit is equivalent to a watt, the SI unit of power?

A) joule/second B) joule/volt
C) joule/ohm D) joule/coulomb

43. As the time required to do a given quantity of work decreases, the power developed

A) decreases
B) increases
C) remains the same

44. What is the maximum amount of work that a 6000.-watt motor can do in 10. seconds?

A) 6.0×10^1 J B) 6.0×10^2 J
C) 6.0×10^3 J D) 6.0×10^4 J

45. Student *A* lifts a 50.-newton box from the floor to a height of 0.40 meter in 2.0 seconds. Student *B* lifts a 40.-newton box from the floor to a height of 0.50 meter in 1.0 second. Compared to student *A*, student *B* does

A) the same work but develops more power
B) the same work but develops less power
C) more work but develops less power
D) less work but develops more power

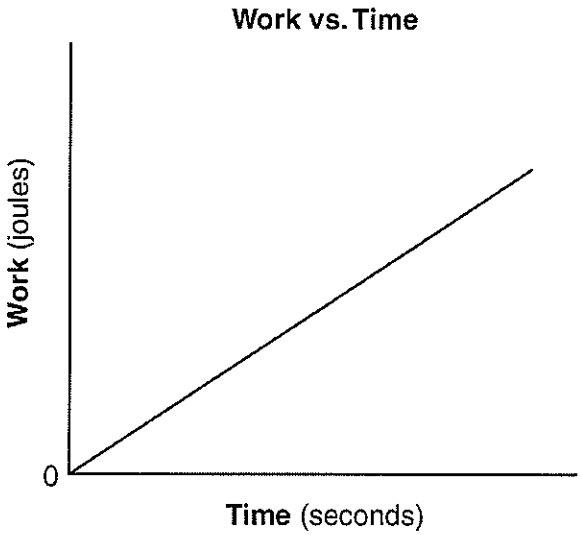
46. A 40.-kilogram student runs up a staircase to a floor that is 5.0 meters higher than her starting point in 7.0 seconds. The student's power output is

A) 29 W B) 280 W
C) 1.4×10^3 W D) 1.4×10^4 W

Skill 30: Rate of Work = Power

47. The graph below represents the relationship between the work done by a student running up a flight of stairs and the time of ascent.

What does the slope of this graph represent?



A) impulse
B) momentum
C) speed
D) power

48. If 20. joules of work is done in 4.0 seconds, the power developed is

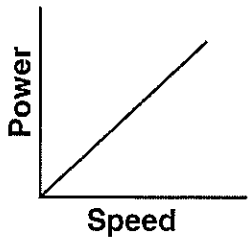
A) 0.20 watt
B) 5.0 watts
C) 16 watts
D) 80. watts

49. One elevator lifts a mass a given height in 10 seconds and a second elevator does the same work in 5 seconds. Compared to the power developed by the first elevator, the power developed by the second elevator is

A) one-half as great
B) twice as great
C) the same
D) four times as great

50. Zazu the Hornbill lifts coconut vertically. Which of the following represents the relationship between the power and the speed at which Zazu lifts the coconut?

A)



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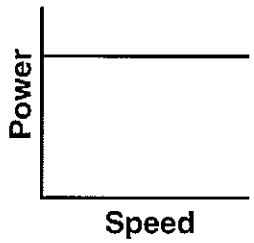

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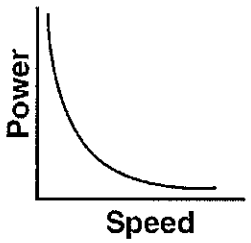

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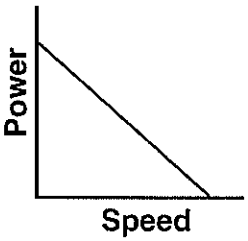


Skill 30: Rate of Work = Power

51. Two elevators, *A* and *B*, move at constant speed. Elevator *B* moves with twice the speed of elevator *A*. Elevator *B* weighs twice as much as elevator *A*. Compared to the power needed to lift elevator *A*, the power needed to lift elevator *B* is

A) the same
B) twice as great
C) half as great
D) four times as great

52. A 70.-kilogram cyclist develops 210 watts of power while pedaling at a constant velocity of 7.0 meters per second east. What average force is exerted eastward on the bicycle to maintain this constant speed?

A) 490 N
B) 30. N
C) 3.0 N
D) 0 N

53. A boat weighing 9.0×10^2 Newtons requires a horizontal force of 6.0×10^2 Newtons to move it across the water at 1.5×10^1 meters per second. The boat's engine must provide energy at the rate of

A) 2.5×10^{-2} J
B) 4.0×10^1 W
C) 7.5×10^3 J
D) 9.0×10^3 W

54. In raising an object vertically at a constant speed of 2.0 meters per second, 10. watts of power is developed. The weight of the object is

A) 5.0 N
B) 20. N
C) 40. N
D) 50. N

55. Car *A* and car *B* of equal mass travel up a hill. Car *A* moves up the hill at a constant speed that is twice the constant speed of car *B*. Compared to the power developed by car *B*, the power developed by car *A* is

A) the same
B) twice as much
C) half as much
D) four times as much

56. If a motor lifts a 400.-kilogram mass a vertical distance of 10. meters in 8.0 seconds, the *minimum* power generated by the motor is

A) $3.2\ 10^2$ W
B) $5.0\ 10^2$ W
C) $4.9\ 10^3$ W
D) $3.2\ 10^4$ W

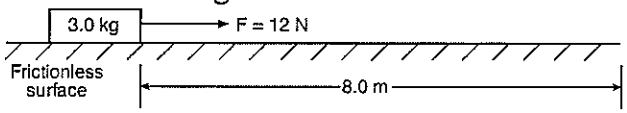
57. What is the maximum height to which a motor having a power rating of 20.4 watts can lift a 5.00-kilogram stone vertically in 10.0 seconds?

A) 0.0416 m
B) 0.408 m
C) 4.16 m
D) 40.8 m

58. What is the average power required to raise a 1.81×10^4-newton elevator 12.0 meters in 22.5 seconds?

A) 8.04×10^2 W
B) 9.65×10^3 W
C) 2.17×10^5 W
D) 4.89×10^6 W

59. A 3.0-kilogram block is initially at rest on a frictionless, horizontal surface. The block is moved 8.0 meters in 2.0 seconds by the application of a 12-newton horizontal force, as shown in the diagram below.

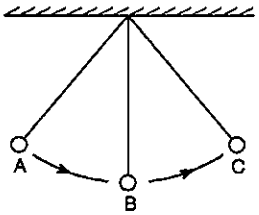


What is the average power developed while moving the block?

A) 24 W
B) 32 W
C) 48 W
D) 96 W

Skill 31: Conservation of Energy

60. Spider-man swings like a pendulum on his web. The diagram below shows three positions, *A*, *B*, and *C*, in Spider-man's swing, released from rest at point *A*. [Neglect friction.]



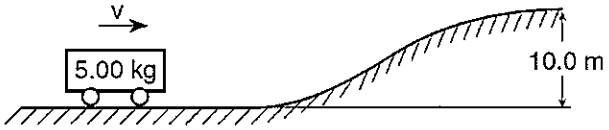
Which statement is true about Spider-man's swing?

A) The potential energy at A equals the kinetic energy at *C*.
B) The speed of the pendulum at A equals the speed of the pendulum at *B*.
C) The potential energy at *B* equals the potential energy at *C*.
D) The potential energy at *A* equals the kinetic energy at *B*.

61. A 0.50-kilogram ball is thrown vertically upward with an initial kinetic energy of 25 joules. Approximately how high will the ball rise? [Neglect air resistance.]

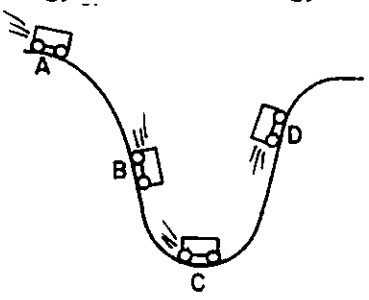
A) 2.6 m
B) 5.1 m
C) 13 m
D) 25 m

62. The diagram below shows a moving, 5.00-kilogram cart at the foot of a hill 10.0 meters high. For the cart to reach the top of the hill, what is the minimum kinetic energy of the cart in the position shown? [Neglect energy loss due to friction.]



A) 4.91 J
B) 50.0 J
C) 250. J
D) 491 J

63. The diagram below shows a cart at four positions as it moves along a frictionless track. At which positions is the sum of the potential energy and kinetic energy of the cart the same?

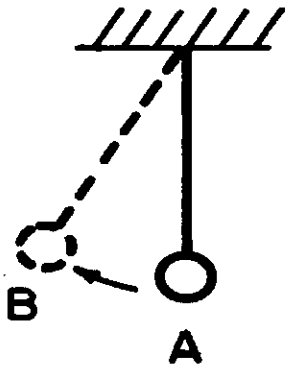


A) *A* and *B* , only
B) *B* and *C*, only
C) *C* and *D*, only
D) all positions, *A* through *D*

64. At what point in its fall does the kinetic energy of a freely falling object equal its potential energy?

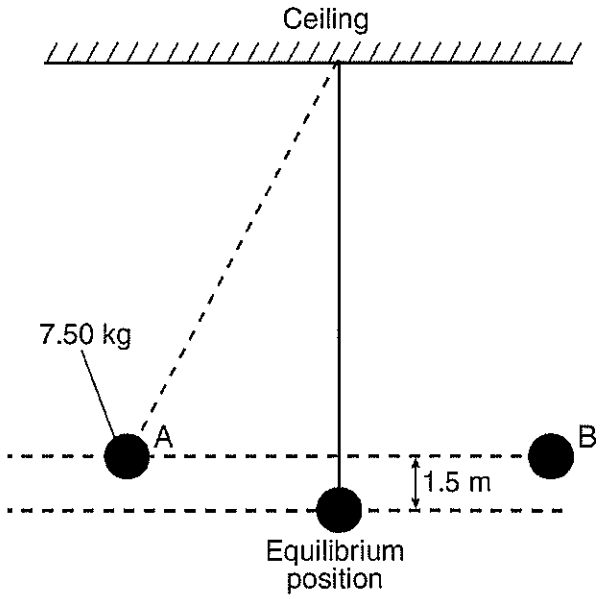
A) at the start of the fall
B) halfway between the start and the end
C) at the end of the fall
D) at all points during the fall

65. As a pendulum swings from position *A* to position *B* as shown in the diagram, its total mechanical energy (neglecting friction)



A) decreases
B) increases
C) remains the same

66. A pendulum is made from a 7.50-kilogram mass attached to a rope connected to the ceiling of a gymnasium. The mass is pushed to the side until it is at position *A*, 1.5 meters higher than its equilibrium position. After it is released from rest at position *A*, the pendulum moves freely back and forth between positions *A* and *B*, as shown in the diagram below.



What is the total amount of kinetic energy that the mass has as it swings freely through its equilibrium position? [Neglect friction.]

A) 11 J
B) 94 J
C) 110 J
D) 920 J

67. **This question has only three choices.**
As a ball falls freely toward the ground, its total mechanical energy

A) decreases
B) increases
C) remains the same

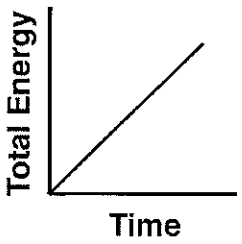
68. A 55.0-kilogram diver falls freely from a diving platform that is 3.00 meters above the surface of the water in a pool. When she is 1.00 meter above the water, what are her gravitational potential energy and kinetic energy with respect to the water's surface?

A) $PE = 1620$ J and $KE = 0$ J
B) $PE = 1080$ J and $KE = 540$ J
C) $PE = 810$ J and $KE = 810$ J
D) $PE = 540$ J and $KE = 1080$ J

69. A child, starting from rest at the top of a playground slide, reaches a speed of 7.0 meters per second at the bottom of the slide. What is the vertical height of the slide? [Neglect friction.]

A) 0.71 m
B) 1.4 m
C) 2.5 m
D) 3.5 m

70. A ball is dropped from the top of a cliff. Which graph best represents the relationship between the ball's total energy and elapsed time as the ball falls to the ground? [Neglect friction.]

A)


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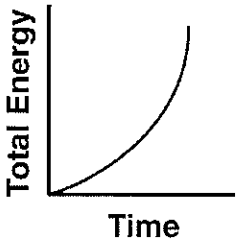
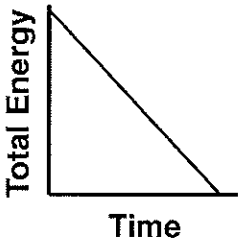


C)


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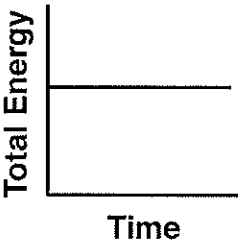
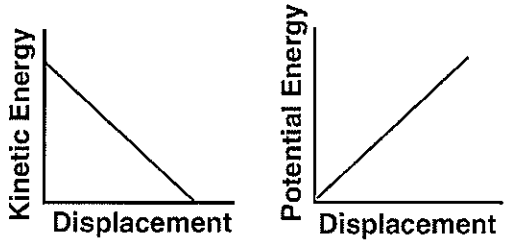
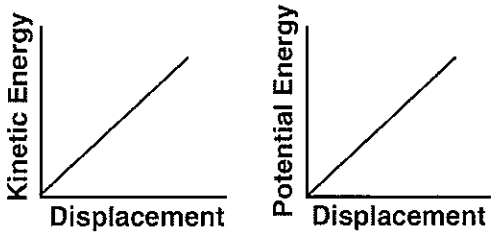
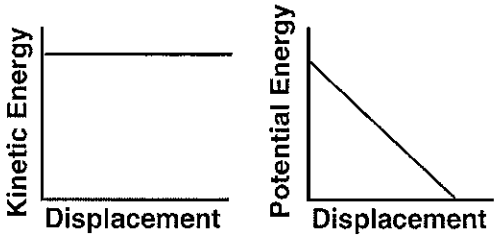


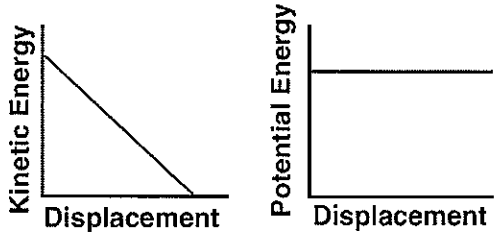
Skill 31: Conservation of Energy

71. An object is thrown vertically upward. Which pair of graphs best represents the object's kinetic energy and gravitational potential energy as functions of its displacement while it rises?

A) 

B) 

C) 

D) 

72. Energy is measured in the same units as

A) force B) momentum
C) work D) power

73. A 3.0-kilogram mass is attached to a spring having a spring constant of 30. newtons per meter. The mass is pulled 0.20 meter from the spring's equilibrium position and released. What is the maximum kinetic energy achieved by the mass spring system?

A) 2.4 J B) 1.5 J
C) 1.2 J D) 0.60 J

74. As an object falls freely, the kinetic energy of the object

A) decreases
B) increases
C) remains the same

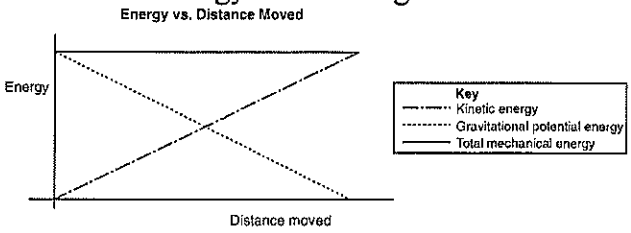
75. As a ball falls freely (without friction) toward the ground, its total mechanical energy

A) decreases
B) increases
C) remains the same

76. A 1-kilogram rock is dropped from a cliff 90 meters high. After falling 20 meters, the kinetic energy of the rock is approximately

A) 20 J B) 200 J
C) 700 J D) 900 J

77. The graph below represents the kinetic energy, gravitational potential energy, and total mechanical energy of a moving block.



Which best describes the motion of the block?

A) accelerating on a flat horizontal surface
B) sliding up a frictionless incline
C) falling freely
D) being lifted at constant velocity

78. The work done in accelerating an object along a frictionless horizontal surface is equal to the object's change in

A) momentum B) velocity
C) potential energy D) kinetic energy

79. A ball is thrown vertically upward. As the ball rises, its total energy (neglecting friction)

A) decreases
B) increases
C) remains the same

Skill 32: Internal Energy

80. A 25-gram paper cup falls from rest off the edge of a tabletop 0.90 meter above the floor. If the cup has 0.20 joule of kinetic energy when it hits the floor, what is the total amount of energy converted into internal (thermal) energy during the cup's fall?

A) 0.02 J B) 0.22 J
C) 2.2 J D) 220 J

81. Two pieces of flint rock produce a visible spark when they are struck together. During this process, mechanical energy is converted into

A) nuclear energy and electromagnetic energy
B) internal energy and nuclear energy
C) electromagnetic energy and internal energy
D) elastic potential energy and nuclear energy

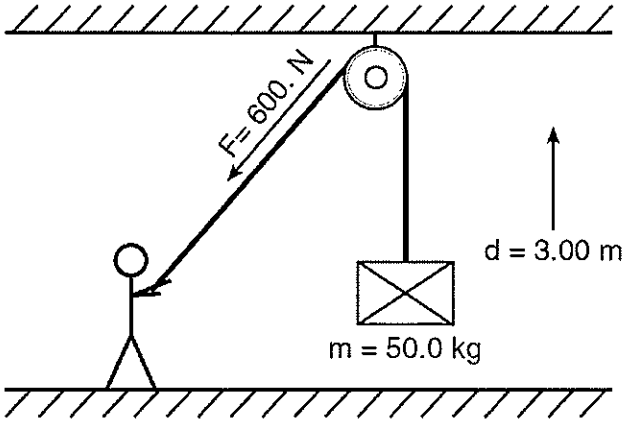
82. A car uses its brakes to stop on a level road. During this process, there must be a conversion of kinetic energy into

A) light energy
B) nuclear energy
C) gravitational potential energy
D) internal energy

83. A 0.2 kg mouse runs up a clock to a height of 1.5 m and slides down a piece of wood back to the base. The mouse has 2J of kinetic energy when he reaches the base. How much work was done against friction during the slide?

A) 3 J B) 1 J C) 2 J D) 0.3 J

84. As shown in the diagram below, a student exerts an average force of 600. newtons on a rope to lift a 50.0-kilogram crate a vertical distance of 3.00 meters.



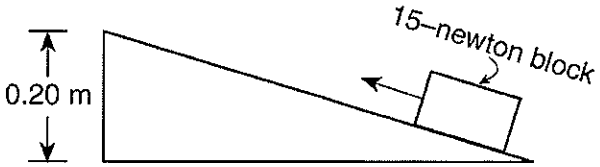
Compared to the work done by the student, the gravitational potential energy gained by the crate is

A) exactly the same B) 330 J less
C) 330 J more D) 150 J more

85. When a force moves an object over a rough, horizontal surface at a constant velocity, the work done against friction produces an increase in the object's

A) weight B) momentum
C) potential energy D) internal energy

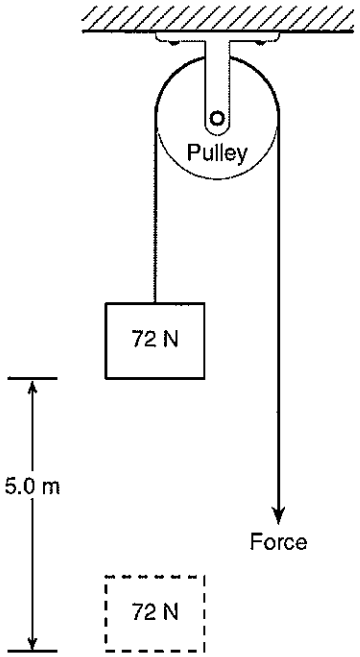
86. A block weighing 15 Newtons is pulled to the top of an incline that is 0.20 meter above the ground, as shown below.



If 4.0 joules of work are needed to pull the block the full length of the incline, how much work is done against friction?

A) 1.0 J B) 0.0 J C) 3.0 J D) 7.0 J

87. In the diagram below, 400. joules of work is done raising a 72-newton weight a vertical distance of 5.0 meters.



How much work is done to overcome friction as the weight is raised?

A) 40. J B) 360 J
C) 400. J D) 760 J

88. Work energy is completely converted to heat energy when all of the work done on an object is used to overcome

A) momentum B) gravity
C) inertia D) friction

89. A force causes an object on a horizontal surface to overcome friction and begin to move. As this happens, the object's internal energy will

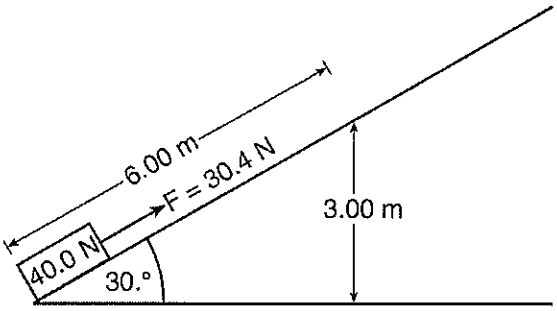
A) decrease B) increase
C) remain the same

Skills 28-32
Long Answer Review

90. Calculate the average power required to lift a 490-newton object a vertical distance of 2.0 meters in 10. seconds. [Show all work, including the equation and substitution with units.]

Base your answers to questions **91** through **94** on the information and diagram below.

A 30.4-newton force is used to slide a 40.0-newton crate a distance of 6.00 meters at constant speed along an incline to a vertical heights of 3.00 meters.



91. State what happens to the internal energy of the crate as it slides along the incline.

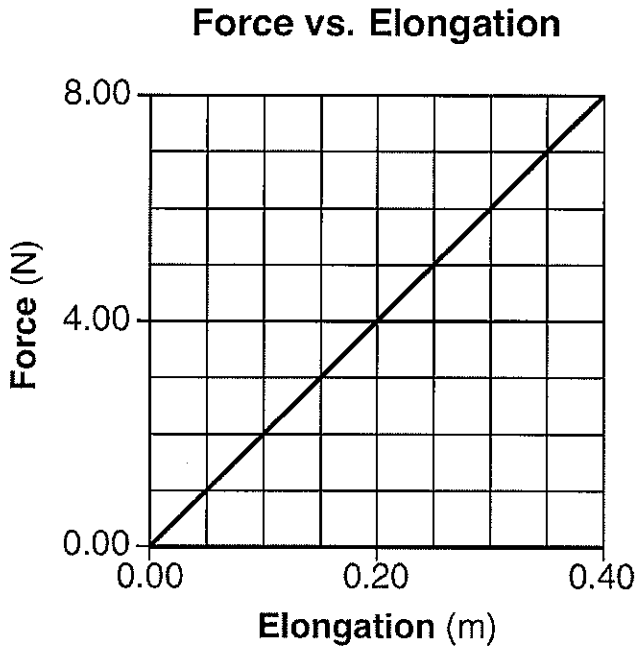
92. State what happened to the kinetic energy of the crate as it slides along the incline.

93. Calculate the total increase in the gravitational potential energy of the crate after it has slid 6.00 meters along the incline. [Show all work, including the equation and substitution with units.]

94. Determine the total work done by the 30.4-newton force in sliding the crate along the incline.

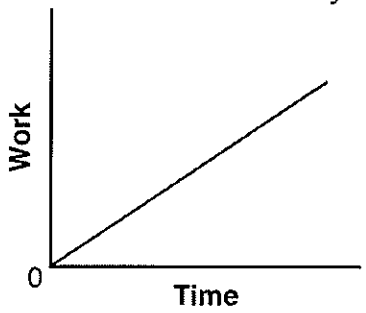
95. Base your answer to the following question on the information below.

A student produced various elongations of a spring by applying a series of forces to the spring. The graph below represents the relationship between the applied force and the elongation of the spring.



Calculate the energy stored in the spring when the elongation is 0.30 meter. [Show all work, including the equation and substitution with units.]

96. The graph below represents the relationship between the work done by a person and time.



Identify the physical quantity represented by the slope of the graph.

97. Calculate the kinetic energy of a particle with a mass of 3.34×10^{-27} kilogram and a speed of 2.89×10^{5} meters per second. [Show all work, including the equation and substitution with units.]

Base your answers to questions **98** and **99** on the information below.

A roller coaster car has a mass of 290. kilograms. Starting from rest, the car acquires 3.13×10^{5} joules of kinetic energy as it descends to the bottom of a hill in 5.3 seconds.

98. Calculate the magnitude of the average acceleration of the roller coaster car as it descends to the bottom of the hill. [Show all work, including the equation and substitution with units.]

99. Calculate the speed of the roller coaster car at the bottom of the hill. [Show all work, including the equation and substitution with units.]

100. A box at the top of a rough incline possesses 981 joules more gravitational potential energy than it does at the bottom. As the box slides to the bottom of the incline, 245 joules of heat is produced. Determine the kinetic energy of the box at the bottom of the incline.

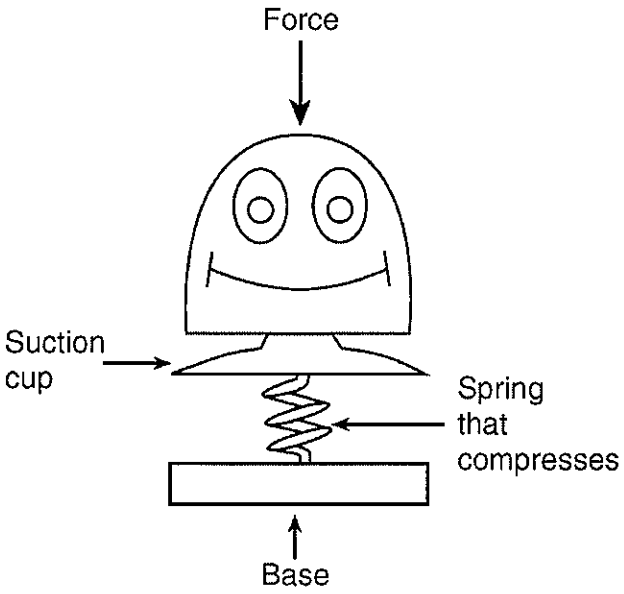
101. Base your answer to the following question on the information below.

A 65-kilogram pole vaulter wishes to vault to a height of 5.5 meters.

Calculate the *minimum* amount of kinetic energy the vaulter needs to reach this height if air friction is neglected and all the vaulting energy is derived from kinetic energy. [Show all work, including the equation and substitution with units.]

Base your answers to questions **102** and **103** on the information below.

A pop-up toy has a mass of 0.020 kilogram and a spring constant of 150 newtons per meter. A force is applied to the toy to compress the spring 0.050 meter.

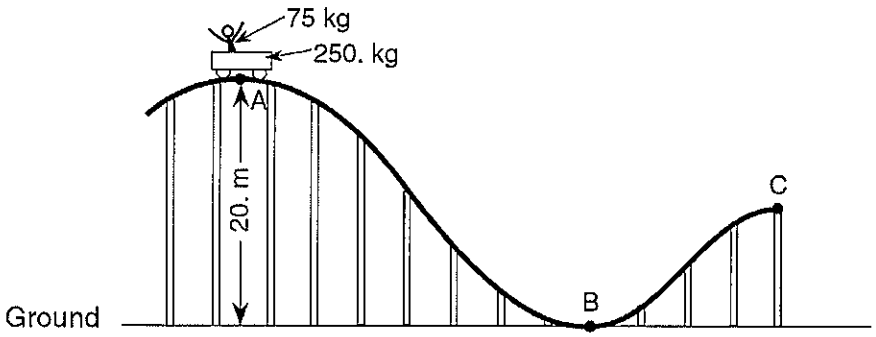


102. The toy is activated and all the compressed spring's potential energy is converted to gravitational potential energy. Calculate the maximum vertical height to which the toy is propelled. [Show all work, including the equation and substitution with units.]

103. Calculate the potential energy stored in the compressed spring. [Show all work, including the equation and substitution with units.]

Base your answers to questions **104** and **105** on the information and diagram below.

A 250.-kilogram car is initially at rest at point *A* on a roller coaster track. The car carries a 75 -kilogram passenger and is 20. meters above the ground at point *A*. [Neglect friction.]

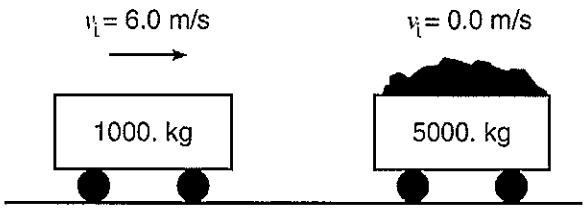


104. Compare the total mechanical energy of the car and passenger at points *A*, *B*, and *C*.

105. Calculate the total gravitational potential energy, relative to the ground, of the car and the passenger at point *A*. [Show all work, including the equation and substitution with units.]

Base your answers to questions **106** through **108** on the information and diagram below.

A 1000.-kilogram empty cart moving with a speed of 6.0 meters per second is about to collide with a stationary loaded cart having a total mass of 5000. kilograms, as shown. After the collision, the carts lock and move together. [Assume friction is negligible.]



106. How does the kinetic energy of the combined carts after the collision compare to the kinetic energy of the carts before the collision?

107. Calculate the kinetic energy of the combined carts after the collision.

108. Calculate the speed of the combined carts after the collision.

Unit 4: Practice Test (Skills 28-32)
2 Pt Questions

109. A bulldog on a skate board rides down a hill. As this happens the total mechanical energy of the system

A) Increases
B) Decreases
C) Remains the same

110. The work done to accelerate a hovercraft down a hallway becomes.... [assume frictionless]

A) potential energy (gravitational)
B) elastic potential energy
C) internal energy
D) kinetic energy

111. A force "F_s" is used to stretch a spring distance "x". Which equation should be used to determine the work done on the spring?

A) $\frac{x}{F_s}$ B) $\frac{F_s}{x}$ C) $F_s x$ D) $\frac{F_s}{2}x$

112. A monkey drops a banana off a cliff. At what point in the fall are the kinetic and potential energy equal?

A) At the top
B) At the bottom
C) One quarter of the way down
D) Half way down

113. As Superman flies upward at a **constant speed** of 30m/s his

A) Kinetic energy remains the same and the potential energy increases
B) Kinetic energy decreases and the potential energy increases
C) Both potential and kinetic energy remains the same
D) Both potential and kinetic energy decrease

114. Ski lift A carries a group of snowboarders with a collective mass of 250kg to an elevation of 500m in a time of 4 minutes. Ski lift B carries a mass of 500kg in skiers to an elevation of 250m in a time of 2 minutes. Compared to Ski lift A, Ski lift B

A) Does the same work, but consumes twice the power
B) Does the same work, but consumes half the power
C) Does more work and consumes the same power
D) Does more work and consumes half the power

115. The rate at which energy is consumed is measured in

A) joules B) joules/second
C) seconds D) meters/second

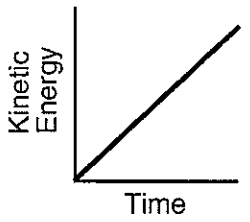
116. Energy and work are classified as

A) Vector quantities
B) Scalar quantities
C) Energy is scalar and work is a vector

117. Which of the following is an appropriate unit for measuring potential energy?

A) J/s B) $kg\frac{m}{s^2}$ C) Nm D) N/m

118. An object falls freely near Earth's surface. Which graph best represents the relationship between the object's kinetic energy and its time of fall

A)


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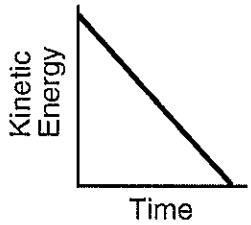
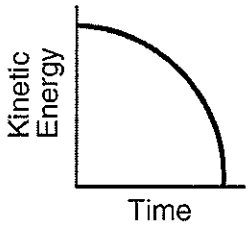
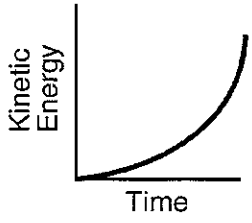
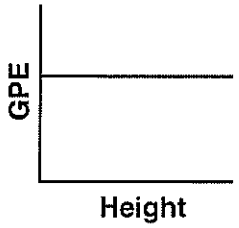


C)


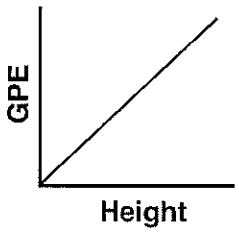
D)


119. Which graph represents the relationship between the gravitational potential energy *(GPE)* of an object near the surface of Earth and its height above the surface of Earth?

A)



B)



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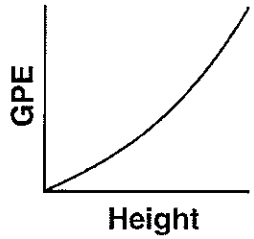
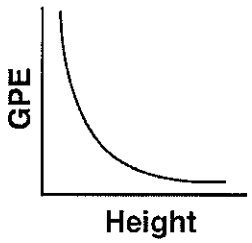


D)

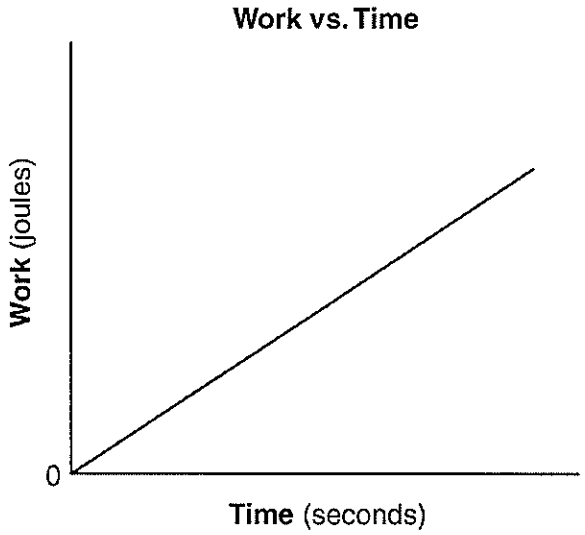


120. When a force moves an object over a rough, horizontal surface at a constant velocity, the work done against friction produces an increase in the object's

A) weight B) momentum
C) potential energy D) internal energy

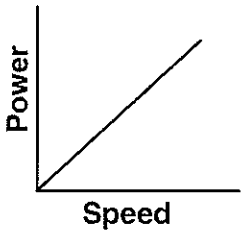
121. The graph below represents the relationship between the work done by a student running up a flight of stairs and the time of ascent.

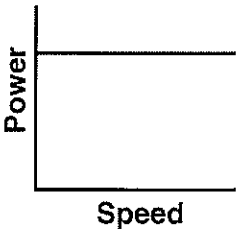
What does the slope of this graph represent?

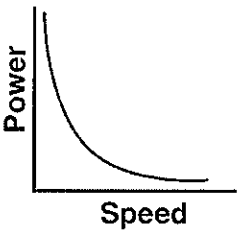


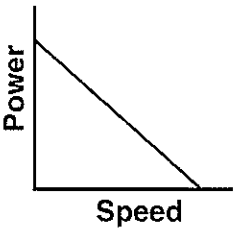
A) impulse B) momentum
C) speed D) power

122. Which graph best represents the relationship between the power required to raise an elevator and the speed at which the elevator rises?

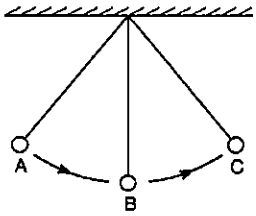
A)


B)


C)


D)


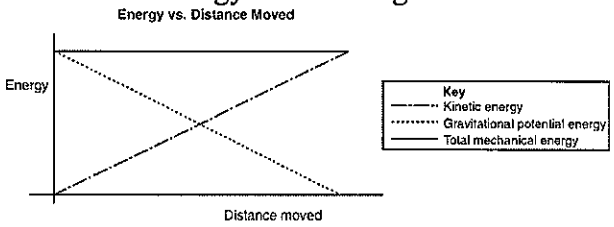
123. The diagram below shows three positions, *A*, *B* , and *C*, in the swing of a pendulum, released from rest at point *A*. [Neglect friction.]



Which statement is true about this swinging pendulum?

A) The potential energy at A equals the kinetic energy at *C*.
B) The speed of the pendulum at A equals the speed of the pendulum at *B*.
C) The potential energy at *B* equals the potential energy at *C*.
D) The potential energy at *A* equals the kinetic energy at *B*.

124. The graph below represents the kinetic energy, gravitational potential energy, and total mechanical energy of a moving block.



Which best describes the motion of the block?

A) accelerating on a flat horizontal surface
B) sliding up a frictionless incline
C) falling freely
D) being lifted at constant velocity

125. The force of attraction between a cow with mass m_c and a "moon" with mass m_m is 900N when separated by a distance of "r". If the distance were changed to 3r, what would be the new force between the cow and the moon?

A) 300N B) 8100N
C) 100N D) 2700N

126. Tyrannosaurus Flex uses his tail to launch watermelons across a ravine into a pile of sand. As the speed of the launched watermelons doubles, the distance required to stop the watermelons if the force is held constant will be

A) doubled B) one-half
C) quadrupled D) one-fourth

Unit 4: Practice Test (Skills 28-32)
3 Pt Questions

127. Groot lifts Rocket Raccoon's mass of 20kg to a height of 10m on Planet X giving Rocket a total gravitational potential energy of 1500J. What is the gravitational field strength on Planet X?

A) 9.8 N/kg B) 5 N/kg
C) 1000 N/kg D) 7.5 N/kg

128. A 4kg sloth climbs slowly from a 2m high limb to a 5m high limb over a period of 12 hours. How much potential energy was gained by the sloth?

A) 1.8×10^{-3} J B) 8 J
C) 118 J D) 78.4 J

129. Captain America jumps on a spring with a spring constant of 240 newtons per meter, the spring is compressed 5 meter. How much energy is stored in the spring?

A) 7.5×10^{3} J B) 3×10^{3} J
C) 1.2×10^{2} J D) 1.5×10^{3} J

130. A monkey named Abu drops a 3kg shiny trinket from a height of 20m. What are the approximate kinetic and potential energy of the trinket after it has fallen 15m?

A) PE = 441J ; KE = 147J
B) PE = 588J ; KE = 0 J
C) PE = 588J ; KE = 441J
D) PE = 147J ; KE = 441J

131. A horizontal force of 40 Newtons pushes a block along a level table at a constant speed of 2 meters per second. How much work is done on the block in 3 seconds?

A) 80 J B) 120 J
C) 480 J D) 240 J

132. A 0.2 kg mouse runs up a clock to a height of 2 m and slides down a piece of wood back to the base. The mouse has 1J of kinetic energy when he reaches the base. How much work was done against friction during the slide?

A) 3 J B) 1 J
C) 2 J D) 0.3 J

133. If Optimus Prime does 2×10^{5}J of work in 2 seconds to launch Bumblebee into the air, the power developed is

A) 2×10^{5} watts B) 4×10^{5} watts
C) 1×10^{5} watts D) 1 watt

134. Raphael the ninja turtle swings his 80kg mass on a rope like a pendulum. Raphael's maximum velocity at the bottom of the swing is 20 m/s. What is the maximum height of the pendulum's swing?

A) 80 m B) 392 m
C) 20 m D) 4m

135. A 25-gram frog falls from the ledge of a stream bank 0.90 meter above a creek. If the frog has 0.20 joule of kinetic energy when it hits the water, what is the total amount of energy converted into internal (thermal) energy during the frog's fall?

A) 0.02 J B) 0.22 J
C) 2.2 J D) 220 J

136. How much work is done by a 500kg Orca whale as it speeds up from 10m/s to 12m/s?

A) 1800J B) 11000J
C) 19800J D) 3600J

	Vocab, Concepts etc	Equations and Units of Measurement	Graphs, Relationships etc
Skill 31: Conservation of Energy			
Skill 32: Work against friction (Internal Energy)			

	Vocab, Concepts etc	Equations and Units of Measurement	Graphs, Relationships etc
Skill 28: Work and types of energy			
Skill 29: Work Energy Theorem			
Skill 30: Power			