Question 1

The law of conversation of energy tell us that energy cannot be:

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B. created or destroyed.
C. measured.
D. calculated.

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Question 2

Under what conditions would a 50kg cannonball have the most kinetic energy?

A. The cannonball is at rest at ground level
B. The cannonball has a speed of 10 m/s and is at ground level.
C. The cannonball is at rest 10 meters above the ground.
D. The cannonball has a speed of 5 m/s and is 5 meters above the ground.

Question 2

Under what conditions would a 50kg cannonball have the most kinetic energy?

A. The cannonball is at rest at ground level
B. **The cannonball has a speed of 10 m/s and is at ground level.** $KE = \frac{1}{2}mv^2$
C. The cannonball is at rest 10 meters above the ground.
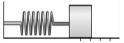D. The cannonball has a speed of 5 m/s and is 5 meters above the ground.

Question 3

Under what conditions would a 50kg cannonball have the most potential energy?

A. The cannonball is at rest at ground level
B. The cannonball has a speed of 10 m/s and is at ground level.
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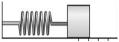$GPE = mgh$

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Question 4

A 20 kg mass is attached a spring at rest as in the image above. The spring is then stretched 1 m to the right, and is released. At the instant the mass has moved 0.5 m back, what types of mechanical energy does the mass possess?

A. Gravitational potential only.
B. Kinetic only
C. Spring potential only.
D. Kinetic and spring potential only

Question 5

A box of old textbooks is on the middle shelf in the bookroom 1.3 m from the floor. If the janitor relocates the box to a shelf that is 2.6 m from the floor, how much work does he do on the box? m = 10 kg.

A. 13 J
B. 26 J
C. 130 J
D. 60 J

Momentum so Grade 8 Only for now

Question 6

A skateboard moves along a frictionless level road at a constant speed. A kid falls straight down onto it. What happens to the velocity of the skateboard?

A. It increases
B. It remains the same
C. It decreases
D. it stops immediately

Question 7

If you push for a half hour or a whole hour against a stationary wall

A. twice as much work is done during the half hour.
B. no work on the wall is done in either case.
C. half as much work is done during the half hour.
D. it is impossible to determine how much work is done.

Question 7

If you push for a half hour or a whole hour against a stationary wall

A. twice as much work is done during the half hour.
B. **no work on the wall is done in either case.**   **W = Fd**
C. half as much work is done during the half hour.
D. it is impossible to determine how much work is done.

Question 8

If you push an object twice as far while applying the same force, you do

A. four times as much work.
B. twice as much work.
C. the same amount of work.
D. half as much work.

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Grade 8 Only

Question 9

A bow is drawn so that it has 50 J of potential energy stored in the bow. Neglecting air resistance, when the bow is fired, the arrow will have a kinetic energy that is

A. less than 50 J.
B. 50 J.
C. more than 50 J.
D. impossible to predict without additional information

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Question 9

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B. **50 J.**
C. more than 50 J.
D. impossible to predict without additional information

Conservation of Mechanical Energy
$ME_i = ME_f$
$SPE_i = KE_f$ (initially no KE, after firing no SPE)

Question 10

A skier skiing down a frictionless incline has its maximum speed

A. halfway down.
B. at the top.
C. at the bottom.
D. depends upon the incline of the ramp.

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Conservation of Mechanical Energy
$ME_i = ME_f$
$GPE_i = KE_f$ (initially no KE, at the bottom no GPE)

Question 11

It takes 40 J to push a large box 4 m across a floor. Assuming the push is in the same direction as the move, what is the magnitude of the force on the box?

A. 10 N
B. 40 N
C. 160 N
D. 4 N

Question 11

It takes 40 J to push a large box 4 m across a floor. Assuming the push is in the same direction as the move, what is the magnitude of the force on the box?

A. 10 N
B. 40 N
C. 160 N
D. 4 N

$W = Fd$
$F = W/d = 40J/4m =$

Question 12

A truck moves 4 times as fast as another identical truck. Compared to the slower truck, the faster truck has

A. 8 times the KE.
B. 16 times the KE.
C. 12 times the KE.
D. 4 times the KE.

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D. 4 times the KE.

$KE = \frac{1}{2} mv^2$

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Question 13

Spring A is extended 4 times as far as another identical spring, called spring B. Compared to the spring B, spring A has

A. 8 times the PEspring.
B. 16 times the PEspring.
C. 12 times the PEspring.
D. 4 times the PEspring.

$$E_p = \frac{1}{2}kx^2 \quad \text{or} \quad PE_{elastic} = \frac{1}{2}kx^2$$

Question 14

Which has greater kinetic energy, a car traveling at 30 km/hr or a car of half the mass traveling at 60 km/hr?

A. the 30 km/hr car
B. the 60 km/hr car
C. Both have the same kinetic energy.
D. More information is needed about the distance traveled.

Question 15

A diver who has a mass of 50 kg steps off a diving board that is 10 m above the water. The diver hits the water with kinetic energy of

A. 500 J.
B. 510 J.
C. 5000 J.
D. 10 J.

Conservation of Mechanical Energy
$ME_i = ME_f$
$GPE_i = KE_f$ (initially no KE, when hits the water no GPE)

Question 16

Which of the following represents the units for energy in base SI units?

A. $\frac{kgm}{s}$

B. $\frac{kgm}{s^2}$

C. $\frac{kgm^2}{s}$

D. $\frac{kgm^2}{s^2}$

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C. $\frac{kgm^2}{s}$

D. $\frac{kgm^2}{s^2}$

F = ma = kgm/s^2

W = Fd = kgm/s^2 . m = **kgm^2/s^2**

KE = ½ mv^2 = kgm/s . m/s = **kgm^2/s^2**

GPE = mgh = kg . m/s^2 . m = **kgm^2/s^2**

Question 17

Which of the following is the energy stored in an object by virtue of its position?

A. Potential energy
B. Gravitational potential energy
C. Spring potential energy
D. Kinetic energy

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Question 18

A force of 10 N stretches a spring that has a spring constant of 20 N/m. The spring obeys Hooke's law.

What is the extension of the spring?

A. 0.5 m
B. 200 m
C. 2 m
D. 20 m

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Question 18

A force of 10 N stretches a spring that has a spring constant of 20 N/m. The spring obeys Hooke's law.

What is the extension of the spring?

A. 0.5 m
B. 200 m
C. 2 m
D. 20 m

F = kx
x = F/k
= 10N / 20 N/m

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Question 19

A force of 10 N stretches a spring that has a spring constant of 20 N/m. The spring obeys Hooke's law.

What is the potential energy stored in the spring?

A. 2.5 J
B. 5.0 J
C. 10 J
D. 200 J

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Question 19

A force of 10 N stretches a spring that has a spring constant of 20 N/m. The spring obeys Hooke's law.

What is the potential energy stored in the spring?

A. 2.5 J
B. 5.0 J
C. 10 J
D. 200 J

$F = kx$
$x = F/k$
$\quad = 10N / 20 \text{ N/m}$

$E_{spring} = \frac{1}{2} kx^2 = \frac{1}{2} * 20 * 0.5^2$