

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) $4.5 \times 10^2 \text{ J}$ B) $9.0 \times 10^2 \text{ J}$
C) $5.4 \times 10^3 \text{ J}$ D) $1.1 \times 10^4 \text{ J}$

$$KE = \frac{1}{2}mv^2$$
$$\frac{1}{2}(75\text{kg})(12\text{m/s})^2$$

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

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

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

A) velocity \leftarrow vector B) momentum \leftarrow vector
C) displacement \leftarrow vector D) kinetic energy \leftarrow scalar

direction involves vector

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

A) decreases B) increases
C) remains the same

as you move up you slow down
so KE decreases

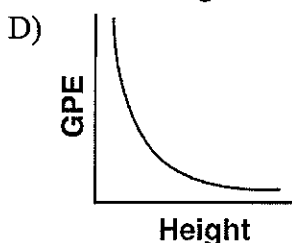
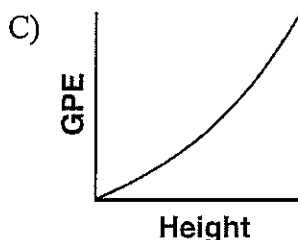
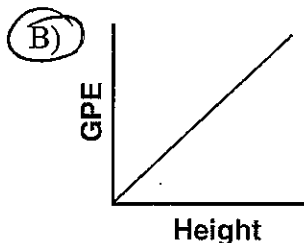
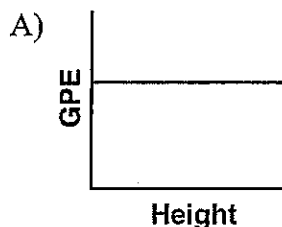
5. A 4kg sloth climbs slowly from a 3m high limb to a 5m high limb over a period of 12 hours. How much potential energy was gained by the sloth?

A) $1.8 \times 10^{-3} \text{ J}$ B) 8 J
C) 118 J D) 78.4 J

$$PE = mgh \quad \Delta h$$
$$(4\text{kg})(9.8\text{m/s}^2)(2\text{m})$$

Skill 28: Types of Energy and Work

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?



$PE = mgh$ ← direct

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. $PE \uparrow$
 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

$PE = mgh$
 all are the same

Power would be different

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

$F_g = mg = 15N$
 $h = .22m$

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?

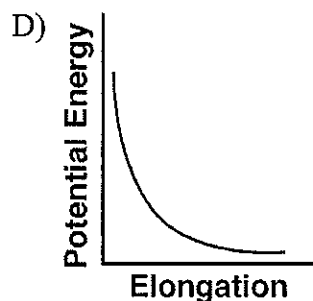
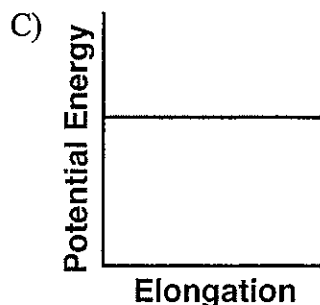
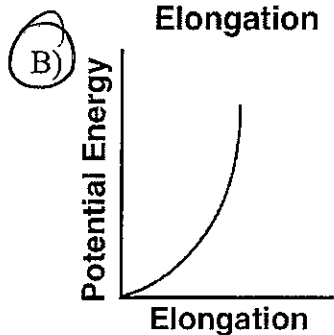
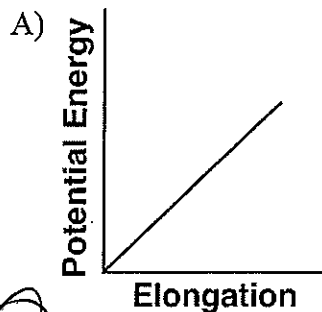
- A) 9.36 N/m
 B) 18.7 N/m
 C) 37.4 N/m
 D) 74.9 N/m

$PE_s = 2.34J$
 $x = .25m$
 $k = ?$

$PE_s = \frac{1}{2}kx^2$
 $2.34J = \frac{1}{2}k(.25m)^2$

Skill 28: Types of Energy and Work

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



$PE_s = \frac{1}{2}kx^2$

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) 3.0 J (B) 7.2 J (C) 12 J (D) 24 J

$k = 80 \text{ N/m}$ $PE_s = ?$
 $x = 0.3 \text{ m}$

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

Work is scalar so add the values without noting direction
 $W = 300 \text{ J} + 400 \text{ J}$

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

$W = Fd$ 10N goes with distance 5m
 $(10\text{N})(5\text{m}) = 50\text{J}$ Only use force that agrees with direction
 The 50N is weight directed down

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

A) lifting the object from the floor to the ceiling Δ changes work done
 B) pushing the object along a horizontal floor against a frictional force Δ change work done
 C) decreasing the speed of the object until it comes to rest Δ changes
 D) holding the object stationary above the ground no Δ no work

Skill 28: Types of Energy and Work

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

$$F_{\text{net}} = \frac{m \Delta v}{\Delta t}$$

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

$$Fd = Fvt \quad F = 40 \text{ N} \quad d = 12 \text{ m}$$

$$d = vt$$

$$F = 40 \text{ N}$$

$$v = 2 \text{ m/s} \quad d = 12 \text{ m}$$

$$t = 6 \text{ s}$$

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

- A) $\text{kg} \cdot \text{m/s}$ B) $\text{kg} \cdot \text{m}^2/\text{s}$
C) $\text{kg} \cdot \text{m/s}^2$ D) $\text{kg} \cdot \text{m}^2/\text{s}^2$
- $ma = F_{\text{net}}$ $mv^2 = KE$
 $mgh = PE$
 $Fd = W$

19. A joule is equivalent to a

- A) $\text{N} \cdot \text{m}$ B) $\text{N} \cdot \text{s}$ C) N/m D) N/s
- Fd

20. Which term identifies a scalar quantity?

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