

AP PHYSICS 1

REVIEW WORK AND ENERGY

Directions: You may write on this sheet. For multiple choice write the **CAPITAL** letter of the best response in the space provided. Answer the other questions in the space provided as completely and as neatly as you can. Show your work and box in your final answers. Use $g=9.8$ m/s² and neglect air resistance unless instructed otherwise.

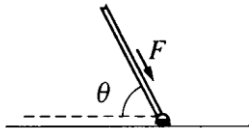
- _____ 1. A bucket falls off a 100m high ledge. The bucket's speed when it is 60 m above the ground is
A. 6 m/s.
B. 17 m/s.
C. 28 m/s.
D. 34 m/s.
E. not enough information.
- _____ 2. A 4 kg block is moving at 12 m/s on a horizontal frictionless surface. A constant force is applied that slows it with an acceleration of 3 m/s/s. How much work must this force do to stop the block?
A. 360 J.
B. -360 J.
C. 576 J.
D. -576 J.
E. -288 J.
- _____ 3. A helicopter rescues a 105 kg shipwreck survivor by lifting him straight up. The survivor moves 15 m up while his speed drops from 4 m/s to 0. What is the work done on him by the applied force?
A. 840 J.
B. 13755 J.
C. 15435 J.
D. 16275 J.
E. 14595 J.
- _____ 4. An object of mass m is lifted at constant velocity a vertical distance H in time t . The power supplied by the lifting force is
(A) $mgHt$ **(B) mgH/t** (C) mg/Ht (D) mgt/H (E) zero
- _____ 5. From the top of a 70-meter-high building, a 1-kilogram ball is thrown directly downward with an initial speed of 10 meters per second. If the ball reaches the ground with a speed of 30 meters per second, the energy lost to friction is most nearly
(A) 0J (B) 100 J **(C) 300 J** (D) 400 J (E) 700 J

_____ 6. When a mass is placed on a spring with a spring constant of 60.0 newtons per meter, the spring is compressed 0.500 meter. How much energy is stored in the spring?

- (A) 60.0 J
(B) 30.0 J
(C) 15.0 J
(D) 7.50 J

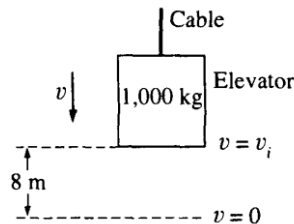
_____ 7. A force F is exerted by a broom handle on the head of the broom, which has a mass m . The handle is at an angle θ to the horizontal, as shown below. The work done by the force on the head of the broom as it moves a distance d across a horizontal floor is

- (A) $Fd \sin \theta$ (B) $Fd \cos \theta$ (C) $Fm \cos \theta$ (D) $Fm \tan \theta$ (E) $Fmd \sin \theta$



_____ 8. A descending elevator of mass 1,000 kg is uniformly decelerated to rest over a distance of 8m by a cable in which the tension is 11,000 N. The speed v_i of the elevator at the beginning of the 8m descent is most nearly

- (A) 4 m/s (B) 10 m/s (C) 13 m/s (D) 16 m/s (E) 21 m/s



_____ 9. After a spring is compressed 0.2 m from its uncompressed length it exerts a 20 N force on a 0.4 kg block resting on a horizontal frictionless surface. After it is released the block will reach a maximum velocity of

- A. 2.1 m/s.
B. 100.0 m/s.
C. 3.2 m/s.
D. 10.0 m/s.
E. 6.3 m/s.

_____10. Three rocks are thrown from a 40 m high cliff, Rock A is thrown at 10 m/s 30 degrees above the horizontal, Rock B is thrown 10 m/s horizontally, and Rock C is thrown 10 m/s 30 degrees below the horizontal, which rock hits the ground with the greatest speed?

A. C

B. B

C. A

D. All 3 hit with the same speed

E. A and C tie, B is slower

_____11. Person X pushes twice as hard against a stationary brick wall as person Y. Which one of the following statements is correct?

A) Both do positive work, but person X does four times the work of person Y.

B) Both do positive work, but person X does twice the work of person Y.

C) Both do the same amount of positive work.

D) Both do zero work.

E) Both do positive work, but person X does one-half the work of person Y.

_____12. If the force on an object is in the negative direction, the work it does on the object must be

A) negative.

B) positive.

C) The work could be either positive or negative, depending on the direction the object moves.

_____13. A 35-N bucket of water is lifted vertically 3.0 m and then returned to its original position. How much work did gravity do on the bucket during this process?

A) 180 J

B) 90 J

C) 45 J

D) 0 J

E) 900 J

_____14. Which one has larger kinetic energy: a 500-kg object moving at 40 m/s or a 1000-kg object moving at 20 m/s?

A) The 500-kg object

B) The 1000-kg object

C) Both have the same kinetic energy.

_____ 15. A truck has four times the mass of a car and is moving with twice the speed of the car. If K_t and K_c refer to the kinetic energies of truck and car respectively, it is correct to say that

A) $K_t = 16K_c$.

B) $K_t = 4K_c$.

C) $K_t = 2K_c$.

D) $K_t = K_c$.

E) $K_t = \frac{1}{2} K_c$.

_____ 16. How much work would a child do while pulling a 12-kg wagon a distance of 4.3 m with a ^{22}N force?

A) 95 J

B) 52 J

C) 67 J

D) 109 J

_____ 17. A traveler pulls on a suitcase strap at an angle 36° above the horizontal. If 555 J of work are done by the strap while moving the suitcase a horizontal distance of ^{15}m , what is the tension in the strap?

A) 46 N

B) 37 N

C) 52 N

D) 56 N

_____ 18. Find the net work done by friction on a box that moves in a complete circle of radius 1.82 m on a uniform horizontal floor. The coefficient of kinetic friction between the floor and the box is 0.25, and the box weighs 65.0 N.

A) 190 J

B) 0 J

C) 1800 J

D) 370 J

_____ 19. A 10-kg mass, hung by an ideal spring, causes the spring to stretch 2.0 cm. What is the spring constant (force constant) for this spring?

A) 5.0 N/cm

B) 49 N/cm

C) 0.20 N/cm

D) 20 N/m

E) 0.0020 N/cm

_____20. A prankster drops a water balloon from the top of a building. If the balloon is traveling at 29.1 m/s when it strikes a window ledge that is 1.5 m above the ground, how tall is the building? Neglect air resistance.

A) 45 m

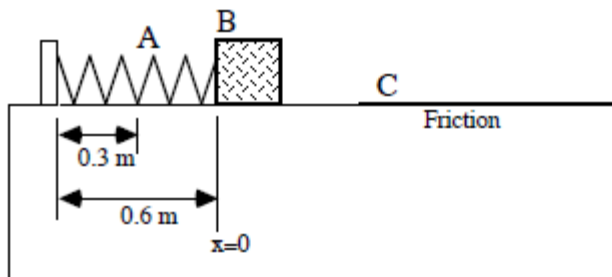
B) 43 m

C) 46 m

D) 47 m

Free Response Questions

A massless spring with force constant $k = 750 \text{ N/m}$ is fastened at its left end to a vertical wall as shown in the figure below. A 3 kg block is pushed so it compresses the spring 0.6 m from its uncompressed length. The figure below shows the situation before the spring is compressed.



(a) Determine the force of the spring on the block when the spring is compressed 0.6 m.

450N

(b) Determine the elastic potential energy stored in the spring when it is compressed 0.6 m.

135J

The block is released from rest when the spring is compressed 0.6 m and is pushed along a horizontal frictionless surface by the spring.

(c) Determine the speed of the block at point A, when the spring is still compressed 0.3 m.

8.2m/s

(d) Determine the speed of the block at point B, after the spring is no longer compressed. The block encounters a surface with a coefficient of friction $\mu_k = 0.5$ at point C.

9.49 m/s

(e) Draw an energy bar chart showing the initial energy in the system and final energy in the system including any work done.