AP Physics B

Instructor: Mr. Butler

Chapter 6 Practice Quiz
Work-Energy and Energy Conservation

1. A force F directed at an angle θ above the horizontal is used to pull a crate a distance D across a level floor. The work done by the force F is

   (A) FD (B) FD cos θ (C) FD sin θ (D) mg sin θ (E) mgD cos θ

2. A ball is thrown vertically upwards with a velocity v and an initial kinetic energy Ek. When half way to the top of its flight, it has a velocity and kinetic energy respectively of

   (A) $\frac{v}{2}, \frac{E_k}{2}$ (B) $\frac{v}{\sqrt{2}}, \frac{E_k}{2}$ (C) $\frac{v}{4}, \frac{E_k}{2}$ (D) $\frac{v}{2}, \frac{E_k}{\sqrt{2}}$ (E) $\frac{v}{\sqrt{2}}, \frac{E_k}{\sqrt{2}}$

3. A mass m is attached to a spring with a spring constant k. If the mass is set into motion by a displacement d from its equilibrium position, what would be the speed, v, of the mass when it returns to equilibrium position?

   (A) $v = \sqrt{\frac{kd}{m}}$ (B) $v^2 = \frac{kd}{m}$ (C) $v = \frac{kd}{mg}$ (D) $v^2 = \frac{mgd}{k}$ (E) $v = d\sqrt{\frac{k}{m}}$

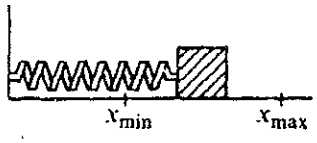
4. Which of the following is true for a system consisting of a mass oscillating on the end of an ideal spring?

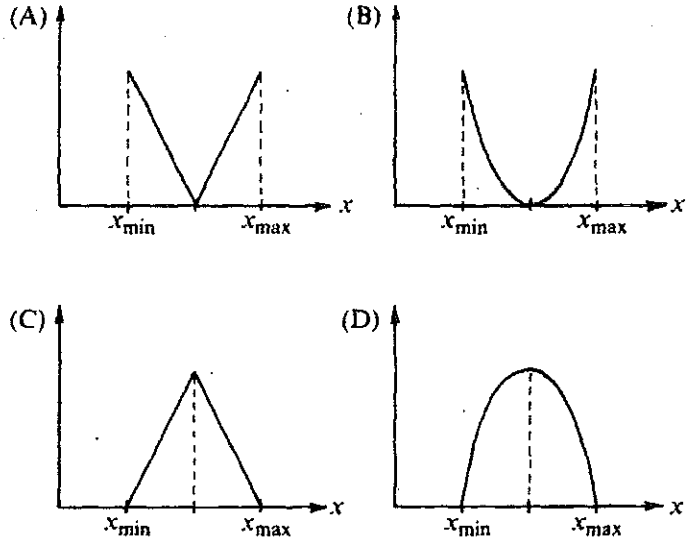
   (A) The kinetic and potential energies are equal to each other at all times.
   (B) The kinetic and potential energies are both constant.
   (C) The maximum potential energy is achieved when the mass passes through its equilibrium position.
   (D) The maximum kinetic energy and maximum potential energy are equal, but occur at different times.
   (E) The maximum kinetic energy occurs at maximum displacement of the mass from its equilibrium position

5. A rock is lifted for a certain time by a force F that is greater in magnitude than the rock's weight W. The change in kinetic energy of the rock during this time is equal to the

   (A) work done by the net force (F-W)
   (B) work done by F alone
   (C) work done by W alone
   (D) difference in the momentum of the rock before and after this time
   (E) difference in the potential energy of the rock before and after this time.

A block oscillates without friction on the end of a spring as shown. The minimum and maximum lengths of the spring as it oscillates are, respectively, x_{min} and x_{max}. The graphs below can represent quantities associated with the oscillation as functions of the length x of the spring.





6. Which graph can represent the total mechanical energy of the block spring system as a function of x ?

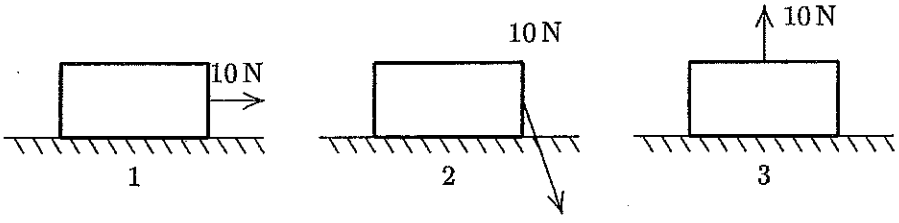
(A) A (B) B (C) C (D) D (E) E

7. Which graph can represent the kinetic energy of the block as a function of x ?

(A) A (B) B (C) C (D) D (E) E

8. A crate moves 10 m to the right on a horizontal surface as a woman pulls on it with a 10-N force. Rank the situations shown below according to the work done by her force, least to greatest.

A. 1, 2, 3
B. 2, 1, 3
C. 2, 3, 1
D. 1, 3, 2
E. 3, 2, 1



9. An object moves in a circle at constant speed. The work done by the centripetal force is zero because:

A. the displacement for each revolution is zero
B. the average force for each revolution is zero
C. there is no friction
D. the magnitude of the acceleration is zero
E. the centripetal force is perpendicular to the velocity

10. The work done by gravity during the descent of a projectile:

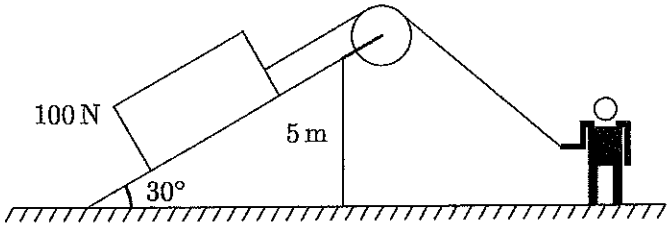
A. is positive
B. is negative
C. is zero
D. depends for its sign on the direction of the y axis
E. depends for its sign on the direction of both the x and y axes

11. A line drive to the shortstop is caught at the same height as it was originally hit. Over its entire flight the work done by gravity and the work done by air resistance, respectively, are:

A. zero; positive
B. zero; negative
C. positive; negative
D. negative; positive
E. negative; negative

12. A man pulls a 100-N crate up a frictionless 30^0 slope 5 m high, as shown. Assuming that the crate moves at constant speed, the work done by the man is:

A. −500 J
B. −250 J
C. 0
D. 250 J
E. 500 J



13. Which of the following bodies has the largest kinetic energy?

A. Mass 3M and speed V
B. Mass 3M and speed 2V
C. Mass 2M and speed 3V
D. Mass M and speed 4V
E. All four of the above have the same kinetic energy

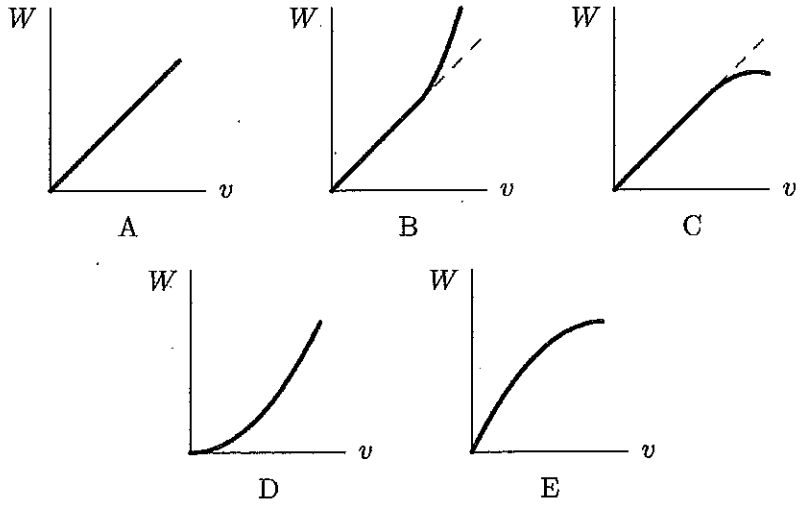
14. The amount of work required to stop a moving object is equal to:

A. the velocity of the object
B. the kinetic energy of the object
C. the mass of the object times its acceleration
D. the mass of the object times its velocity
E. the square of the velocity of the object

15. Camping equipment weighing 6000 N is pulled across a frozen lake by means of a horizontal rope. The coefficient of kinetic friction is 0.05. How much work is done by the campers in pulling the equipment 1000 m if its speed is increasing at the constant rate of 0.20 m/s^2?

A. -1.2×10^6 J
B. 1.8×10^5 J
C. 3.0×10^5 J
D. 4.2×10^5 J
E. 1.2×10^6 J

16. A crate is initially at rest on a horizontal frictionless table. A constant horizontal force F is applied. Which of the following ive graphs is a correct plot of work W as a function of the crate's speed v?



17. A nonconservative force:

A. violates Newton's second law
B. violates Newton's third law
C. cannot do any work
D. must be perpendicular to the velocity of the particle on which it acts
E. none of the above

18. A force on a particle is conservative if:

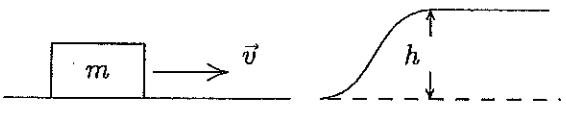
A. its work equals the change in the kinetic energy of the particle
B. it obeys Newton's second law
C. it obeys Newton's third law
D. its work depends on the end points of every motion, not on the path between
E. it is not a frictional force

19. Two objects interact with each other and with no other objects. Initially object A has a speed of 5 m/s and object B has a speed of 10 m/s. In the course of their motion they return to their initial positions. Then A has a speed of 4 m/s and B has a speed of 7 m/s. We can conclude:

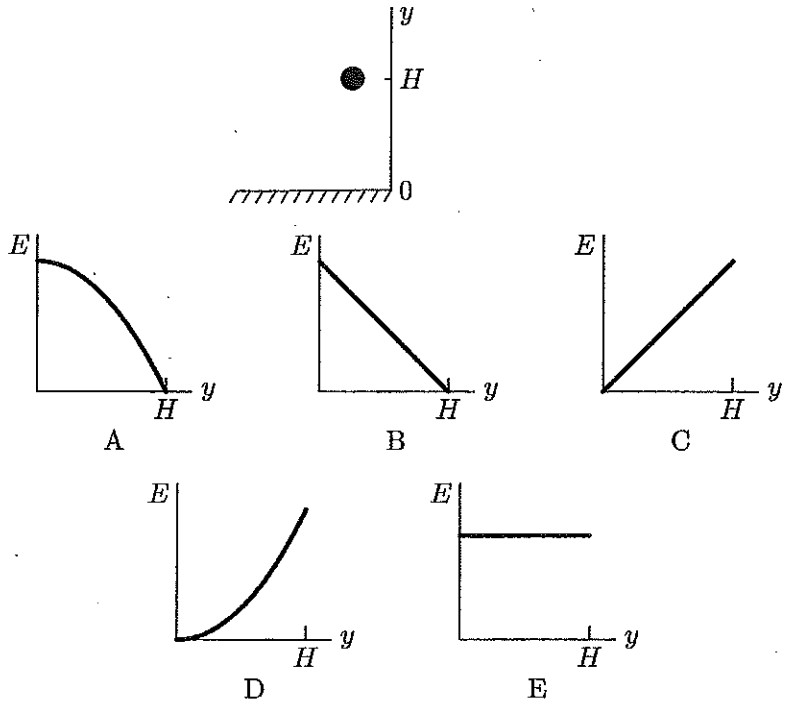
A. the potential energy changed from the beginning to the end of the trip
B. mechanical energy was increased by nonconservative forces
C. mechanical energy was decreased by nonconservative forces
D. mechanical energy was increased by conservative forces
E. mechanical energy was decreased by conservative forces

20. For a block of mass m to slide without friction up the rise of height h shown, it must have a minimum initial kinetic energy of:

A. *gh*
B. *mgh*
C. *gh*/2
D. *mgh*/2
E. 2*mgh*

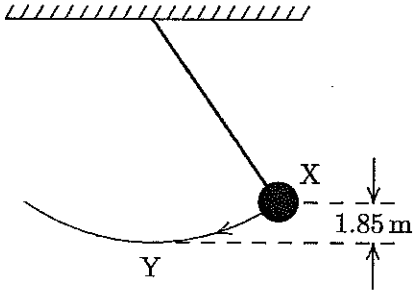


21. A ball is held at a height H above a floor. It is then released and falls to the floor. If air resistance can be ignored, which of the five graphs below correctly gives the mechanical energy E of the Earth-ball system as a function of the altitude y of the ball?



22. A simple pendulum consists of a 2.0-kg mass attached to a string. It is released from rest at X as shown. Its speed at the lowest point Y is about:

A. 0.90 m/s
B. √3.6 m/s
C. 3.6 m/s
D. 6.0 m/s
E. 36 m/s



23. A block of mass m is initially moving to the right on a horizontal frictionless surface at a speed v. It then compresses a spring of spring constant k. At the instant when the kinetic energy of the block is equal to the potential energy of the spring, the spring is compressed a distance of:

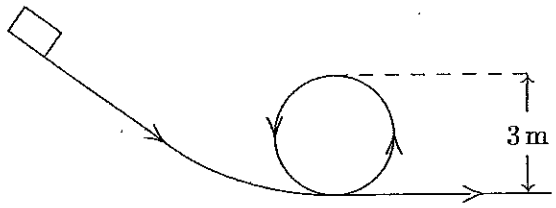
A. $v_0\sqrt{m/2k}$
B. $(1/2)mv^2$
C. $(1/4)mv^2$
D. $mv^2/4k$
E. $(1/4)\sqrt{mv/k}$

24. A block slides across a rough horizontal table top. The work done by friction changes:

A. only the kinetic energy
B. only the potential energy
C. only the internal energy
D. only the kinetic and potential energies
E. only the kinetic and internal energies

25. A small object slides along the frictionless loop-the-loop with a diameter of 3 m. What minimum speed must it have at the top of the loop?

A. 1.9 m/s
B. 3.8 m/s
C. 5.4 m/s
D. 15 m/s
E. 29 m/s



Answers

1. B	6. E	11. B	16. D	21. E
2. B	7. D	12. E	17. E	22. D
3. E	8 E	13. C	18. D	23. A
4. D	9. E	14. B	19. C	24. E
5. A	10. A	15. D	20. B	25. B