

Name: _____ Date: _____

1. Vectors \vec{a} and \vec{b} each have magnitude L . When drawn with their tails at the same point, the angle between them is 30° . The value of $\vec{a} \cdot \vec{b}$ is:
 - A) zero
 - B) L^2
 - C) $\sqrt{3}L^2/2$
 - D) $2L^2$
 - E) none of these

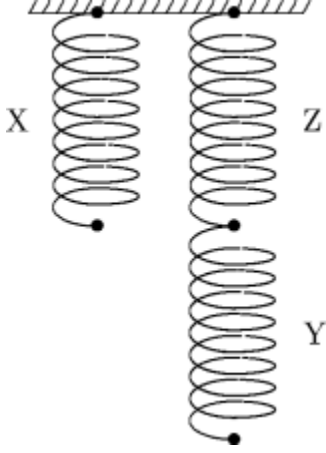
2. A watt · second is a unit of:
 - A) force
 - B) power
 - C) displacement
 - D) speed
 - E) energy

3. A 0.50-kg object moves on a horizontal frictionless circular track with a radius of 2.5 m. An external force of 3.0 N, always tangent to the track, causes the object to speed up as it goes around. If it starts from rest, then at the end of one revolution the radial component of the force of the track on it is:
 - A) 19 N
 - B) 38 N
 - C) 47 N
 - D) 75 N
 - E) 96 N

4. A 0.50-kg object moves in a horizontal circular track with a radius of 2.5 m. An external force of 3.0 N, always tangent to the track, causes the object to speed up as it goes around. The work done by the external force as the mass makes one revolution is:
 - A) 24 J
 - B) 47 J
 - C) 59 J
 - D) 94 J
 - E) 120 J

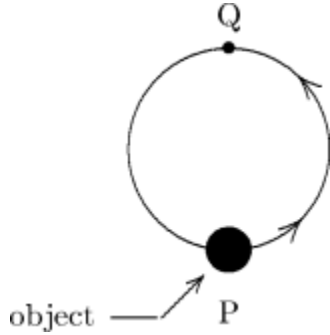
Write the letter for the correct answer on the answer sheet. Write clearly.

5. Three identical ideal springs (X,Y,Z) are arranged as shown. When a 4.0-kg block is hung on X, the block remains at rest when it is released with the spring elongated by 3.0 cm. When a 6.0-kg block is hung on Y, the block remains at rest when it is released with the spring elongated by:

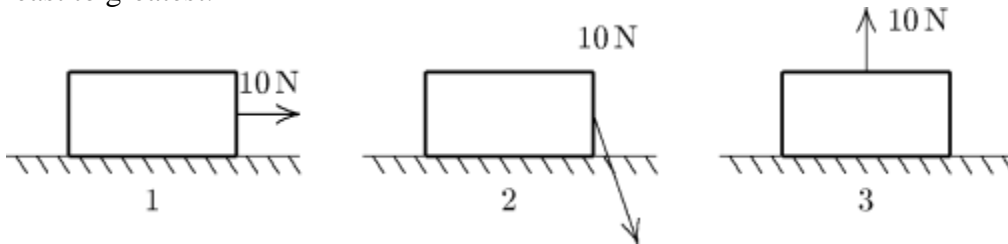


- A) 2.0 cm
 B) 4.0 cm
 C) 4.5 cm
 D) 6.0 cm
 E) 9.0 cm
6. In raising an object to a given height by means of an inclined plane, as compared with raising the object vertically, there is a reduction in:
- A) work required
 B) distance pushed
 C) friction
 D) force required
 E) value of the acceleration due to gravity
7. A watt is:
- A) a $\text{kg} \cdot \text{m}/\text{s}^3$
 B) a $\text{kg} \cdot \text{m}^2/\text{s}$
 C) a $\text{kg} \cdot \text{m}^2/\text{s}^3$
 D) a $\text{kg} \cdot \text{m}/\text{s}$
 E) a $\text{kg} \cdot \text{m}^2/\text{s}^2$

8. A man moves the 10-g object shown in a vertical plane from position P to position Q along a circular track of radius 20 m. The process takes 0.75 min. The work done by the man is about:



- A) 1 J
 B) 2 J
 C) 4 J
 D) 6 J
 E) 12 J
9. 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

10. A sledge (including load) weighs 5000 N. It is pulled on level snow by a dog team exerting a horizontal force on it. The coefficient of kinetic friction between sledge and snow is 0.05. How much work is done by the dog team pulling the sledge 1000 m at constant speed?
- A) 2.5×10^4 J
 - B) 2.5×10^5 J
 - C) 5.0×10^5 J
 - D) 2.5×10^6 J
 - E) 5.0×10^6 J
11. Two bodies, A and B, have equal kinetic energies. The mass of A is nine times that of B. The ratio of the translational momentum of A to that of B is:
- A) 1:9
 - B) 1:3
 - C) 1:1
 - D) 3:1
 - E) 9:1
12. A boy holds a 40-N weight at arm's length for 10 s. His arm is 1.5 m above the ground. The work done by the force of the boy on the weight while he is holding it is:
- A) 0
 - B) 6.1 J
 - C) 40 J
 - D) 60 J
 - E) 90 J
13. A particle moves 5 m in the positive x direction while being acted upon by a constant force $\vec{F} = (4\text{ N})\hat{i} + (2\text{ N})\hat{j} - (4\text{ N})\hat{k}$. The work done on the particle by this force is:
- A) 20 J
 - B) 10 J
 - C) -20 J
 - D) 30 J
 - E) impossible to calculate without knowing other forces

14. The weight of an object on the moon is one-sixth of its weight on Earth. The ratio of the kinetic energy of a body on Earth moving with speed V to that of the same body moving with the same speed on the Moon is:
- A) 6:1
 - B) 36:1
 - C) 1:1
 - D) 1:6
 - E) 1:36
15. An ideal spring is hung vertically from the ceiling. When a 2.0-kg block hangs at rest from it the spring is extended 6.0 cm from its relaxed length. A upward external force is then applied to the block to move it upward a distance of 16 cm. While the block is moving upward the work done by the spring is:
- A) -1.0 J
 - B) -0.52 J
 - C) -0.26 J
 - D) 0.52 J
 - E) 1.0 J
16. A Boston Red Sox baseball player catches a ball of mass m that is moving toward him with speed v . While bringing the ball to rest, his hand moves back a distance d . Assuming constant deceleration, the horizontal force exerted on the ball by his hand is:
- A) mv/d
 - B) mvd
 - C) mv^2/d
 - D) $2mv/d$
 - E) $mv^2/(2d)$
17. An ideal spring is hung vertically from the ceiling. When a 2.0-kg mass hangs at rest from it the spring is extended 6.0 cm from its relaxed length. A downward external force is now applied to the mass to extend the spring an additional 10 cm. While the spring is being extended by the force, the work done by the spring is:
- A) -3.6 J
 - B) -3.3 J
 - C) -3.4×10^{-5} J
 - D) 3.3 J
 - E) 3.6 J

- 18.** 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
- 19.** A 1-kg block is lifted vertically 1 m by a boy. The work done by the boy is about:
- A) 1 ft · lb
 - B) 1 J
 - C) 10 J
 - D) 0.1 J
 - E) zero
- 20.** The amount of work required to stop a moving object is equal to:
- A) the initial speed of the object
 - B) the initial kinetic energy of the object
 - C) the mass of the object times its acceleration
 - D) the mass of the object times its initial speed
 - E) the square of the initial speed of the object

Answer Key

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

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