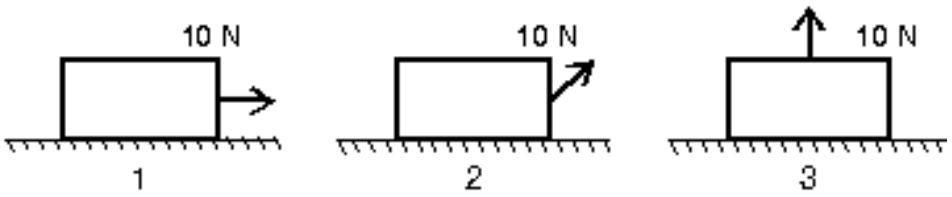
Practice Test 2

Name: _____ Date: _____

1. The coefficient of kinetic friction:
   A) is in the direction of the frictional force
   B) is in the direction of the normal force
   C) is the ratio of force to area
   D) can have units of newtons
   E) none of the above

2. A forward horizontal force of 12 N is used to pull a 240-N crate at constant velocity across a horizontal floor. The coefficient of friction is:
   A) 0.5
   B) 0.05
   C) 2
   D) 0.2
   E) 20

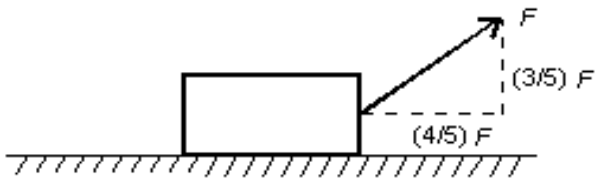
3. A crate rests on a horizontal surface and a woman pulls on it with a 10-N force. No matter what the orientation of the force, the crate does not move. Rank the situations shown below according to the magnitude of the frictional force of the surface on the crate, least to greatest.



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

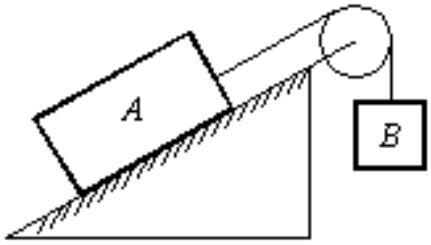
4. A car is traveling at 15 m/s on a horizontal road. The brakes are applied and the car skids to a stop in 4.0 s. The coefficient of kinetic friction between the tires and road is:
   A) 0.38
   B) 0.69
   C) 0.76
   D) 0.92
   E) 1.11

5. A 400-N block is dragged along a horizonatl surface by an applied force ¢ as shown. The coefficient of kinetic friction is $u_k = 0.4$ and the block moves at constant velocity. The magnitude of ¢ is:



A) 100 N
B) 150 N
C) 200 N
D) 290 N
E) 400 Nb

6. Block A, with a mass of 10 kg, rests on a 35° incline. The coefficient of static friction is 0.40. An attached string is parallel to the incline and passes over a massless, frictionless pulley at the top. The largest mass m_B, attached to the dangling end, for which A remains at rest is:



A) 2.5 kg
B) 3.5 kg
C) 5.9 kg
D) 9.0 kg
E) 10.5 kg

7. A ball is thrown downward from the edge of a cliff with an initial speed that is three times the terminal speed. Initially its acceleration is
   A) upward and greater than g
   B) upward and less than g
   C) downward and greater than *g*
   D) downward and less than *g*
   E) downward and equal to *g*

8. An object of mass m and another object of mass $2m$ are each forced to move along a circle of radius 1.0 m at a constant speed of 1.0 m/s. The magnitudes of their accelerations are:
   A) equal
   B) in the ratio of $\sqrt{2}$: 1
   C) in the ratio of 2 : 1
   D) in the ratio of 4 : 1
   E) zero

9. If a certain car, going with speed v_1, rounds a level curve with a radius R_1, it is just on the verge of skidding. If its speed is now doubled, the radius of the tightest curve on the same road that it can round without skidding is:
   A) $2R_1$
   B) $4R_1$
   C) $R_1/2$
   D) $R_1/4$
   E) R_1

10. One end of a 1.0-m long string is fixed, the other end is attached to a 2.0-kg stone. The stone swings in a vertical circle, passing the bottom point at 4.0 m/s. The tension force of the string (in newtons) at this point is about:
   A) 0
   B) 12
   C) 20
   D) 32
   E) 52

11. A coin is placed on a horizontal phonograph turntable. Let N be the normal force exerted by the turntable on the coin, f be the frictional force exerted by the turntable on the coin, and $f_{s,\,max}$ be the maximum force of the static friction. The speed of the turntable is increased in small steps. If the coin does not slide, then
   A) N increases, f increases, and $f_{s,\,max}$ stays the same
   B) N increases, f increases, and $f_{s,\,max}$ increases
   C) f increases and both N and $f_{s,\,max}$ stay the same
   D) N, f, and $f_{s,\,max}$ all stay the same
   E) N, f, and $f_{s,\,max}$ all increase

12. 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

13. 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

14. A particle moves 5 m in the positive *x* direction while being acted upon by a constant force
    ¢ = (4 N)3 + (2 N)z – (4 N)y. The work done on the particle by this force is:
    A) 20 J
    B) 10 J
    C) –20 J
    D) 30 J
    E) is impossible to calculate without knowing other forces

15. Which of the following bodies has the largest kinetic energy?
    A) Mass 3*M* and speed *V*
    B) Mass 3*M* and speed 2*V*
    C) Mass 2*M* and speed 3*V*
    D) Mass *M* and speed 4*V*
    E) All four of the above have the same kinetic energy

16. The velocity of a particle moving along the *x* axis changes from v_i to v_f. For which values of v_i and v_f is the total work done on the particle positive?
    A) v_i = 5m/s, v_f = 2m/s
    B) v_i = 5m/s, v_f = –2m/s
    C) v_i = –5m/s, v_f = –2m/s
    D) v_i = –5m/s, v_f = 2m/s
    E) v_i = –2m/s, v_f = –5m/s

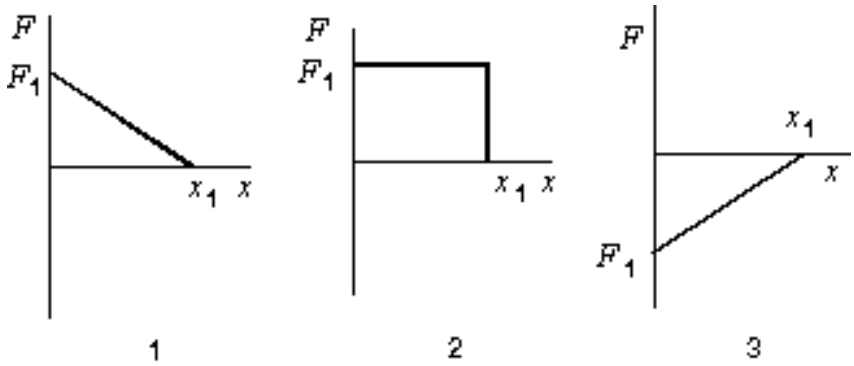
17. The amount of work required to stop a moving object is equal to the:
    A) velocity of the object
    B) kinetic energy of the object
    C) mass of the object times its acceleration
    D) mass of the object times its velocity
    E) square of the velocity of the object

18. A 4-kg cart starts up an incline with a speed of 3 m/s and comes to rest 2 m up the incline. The total work done on the cart is:
    A) 6 J
    B) 8 J
    C) 12 J
    D) 18 J
    E) impossible to calculate without more information

19. At time $t = 0$ a 2-kg particle has a velocity in m/s of (4 m/s)3 – (3 m/s)z. At $t = 3$ s its velocity is (2 m/s)3 + (3 m/s)z. During this time the work done on it was:
    A) 4 J
    B) –4 J
    C) –12 J
    D) –40 J
    E) (4 J)3 + (36 J)z

20. Only if a force on a particle is conservative:
    A) is particle is conservative when the particle moves exactly once around any closed path
    B) is it work equals the change in the kinetic energy of the particle
    C) it obeys Newton's second law
    D) it obeys Newton's third law
    E) it is not a frictional force

21. The graphs below show the magnitude of the force on a particle as the particle moves along the positive x axis from the origin to $x = x_1$. The force is parallel to the x axis and is conservative. The maxium magnitude F_1 has the same value for all graphs. Rank the situations according to the change in the potential energy associated with the force, least (or most negative) to greatest (or most positive).

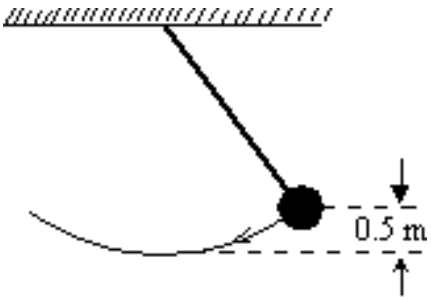


A) 1, 2, 3
B) 1, 3, 2
C) 2, 3, 1
D) 3, 2, 1
E) 2, 1, 3

22. An elevator is rising at constant speed. Consider the following statements:
I. the upward cable force is constant
II. the kinetic energy of the elevator is constant
III. the gravitational potential energy of the Earth-elevator system is constant
IV. the acceleration of the elevator is zero
V. the mechanical energy of the Earth-elevator system is constant

A) all five are true
B) only II and V are true
C) only IV and V are true
D) only I, II, and III are true
E) only I, II, and IV are true

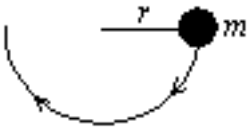
23. The long pendulum shown is drawn aside until the ball has risen 0.5 m. It is then given an initial speed of 3.0 m/s.. The speed of the ball at its lowest position is:



A) zero
B) 0.89 m/s
C) 3.1 m/s
D) 3.7 m/s
E) 4.3 m/s

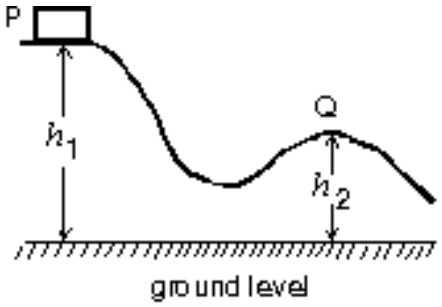
24. An ideal spring is used to fire a 15.0-g block horizontally across a frictionless table top. The spring has a spring constant of 20 N/m and is initially compressed by 7.0 cm. The speed of the block as it leaves the spring is:
A) 0
B) 1.9×10^{-3} m/s
C) 2.6×10^{-2} m/s
D) 0.39 m/s
E) 2.6 m/s

25. A small object of mass *m*, on the end of a light cord, is held horizontally at a distance *r* from a fixed support as shown. The object is then released. What is the in the cord when the object is at the lowest point of its swing?



A) *mg*/2
B) *mg*
C) 2 *mg*
D) 3 *mg*
E) *mgr*

26. A block is released from rest at point P and slides along the frictionless track shown. At point Q, its speed is:

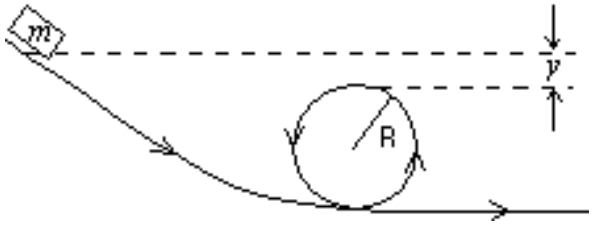


A) $2g\sqrt{h_1 - h_2}$
B) $2g(h_1 - h_2)$
C) $(h_1 - h_2)/2g$
D) $\sqrt{2g\left(h_1 - h_2\right)}$
E) $(h_1 - h_2)^2/2g$

27. A ball of mass *m*, at one end of a string of length *L*, rotates in a vertical circle just fast enough to prevent the string from going slack at the top of the circle. The speed of the ball at the bottom of the circle is:

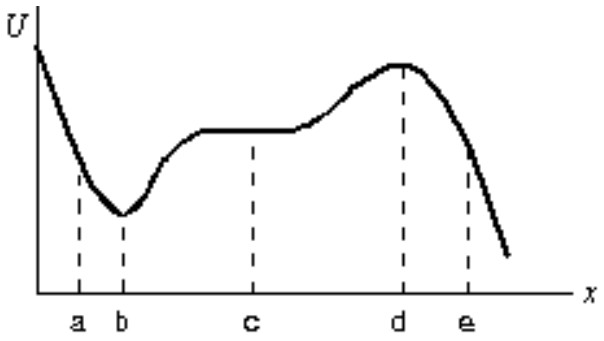
A) $\sqrt{2gL}$
B) $\sqrt{3gL}$
C) $\sqrt{4gL}$
D) $\sqrt{5gL}$
E) $\sqrt{7gL}$

28. A small object of mass m starts at rest at the position shown and slides along the frictionless loop-the-loop track of radius R. What is the smallest value of y such that the object will slide without losing contact with the track?



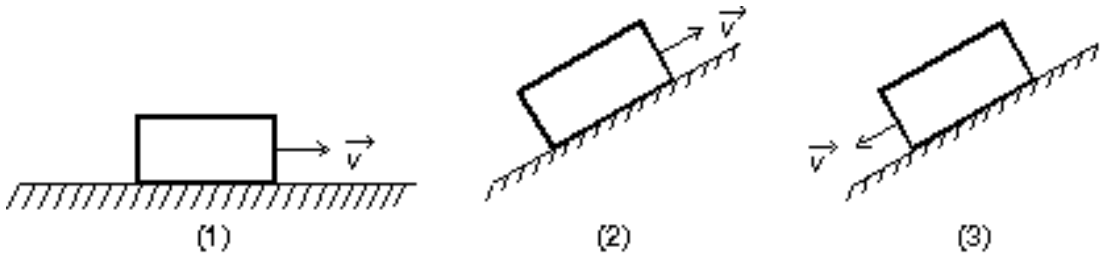
A) $R/4$
B) $R/2$
C) R
D) $2R$
E) zero

29. The diagram shows a plot of the potential energy as a function of x for a particle moving along the x axis. The points of unstable equilibrium are:



A) only a
B) only b
C) only c
D) only d
E) b and d

30. Three identical blocks move either on a horizontal surface, up a plane, or down a plane, as shown below. They all start with the same speed and continue to move until brought to rest by friction. Rank the three situations according to the mechanical energy dissipated by friction, least to greatest.



A) The same for all cases
B) 1, 2, 3
C) 1, then 2 and 3 tie
D) 3, 2, 1
E) 2, 1, 3