Concept of Force
Concept Questions

Question 1: You are pushing a wooden crate across the floor at constant speed. You decide to turn the crate on end, reducing by half the surface area in contact with the floor. In the new orientation, to push the same crate across the same floor with the same speed, the force that you apply must be about

1. four times as great
2. twice as great
3. equally great
4. half as great
5. one-fourth as great

as the force required before you changed the crate's orientation.

Question 2 A massive rope pulls a block at a constant speed. There is a non-zero contact force (friction) between the block and the table. Is the tension in the rope

1) greater than the pulling force?
2) equal to the pulling force?
3) less than the pulling force?

Question 3 Suppose you are sitting in a soundproof, windowless room aboard a hovercraft moving over flat terrain. The following motions occur on your trip.

A. rotation
B. deviation from the horizontal orientation
C. motion at a steady speed
D. acceleration
E. state of rest with respect to ground

Which of these can you detect from inside the room?

1.all of them
2.A, B, D
3.C, E
4.B, D
5. A, B, D, E
6. A, D
7. A
8. D

Question 4 An object is held in place by friction on an inclined surface. The angle of inclination is increased until the object starts moving. If the surface is kept at this angle, the object

1. slows down.
2. moves at uniform speed.
3. speeds up.
4. none of the above

Question 5 Consider a person standing in an elevator that is accelerating upward. The upward normal force N exerted by the elevator floor on the person is

1. larger than

2. identical to

3. smaller than

the downward force of gravity on the person.

Question 6 Consider a car at rest on a level surface. We can conclude that the downward gravitational pull of Earth on the car and the upward contact force of Earth on it are equal and opposite because

1. the two forces form an interaction pair.

2. the net force on the car is zero.

3. neither of the above.

4. unsure

Question 7: A constant force is exerted on a cart that is initially at rest on an air track. Friction between the cart and the track is negligible. The force acts for a short time interval and gives the cart a certain final speed.

air track   F

To reach the same final speed with a force that is only half as big, the force must be exerted on the cart for a time interval

1. four times as long as
2. twice as long as
3. equal to
4. half as long as
5. a quarter of

that for the stronger force.

Question 8 A constant force is exerted for a short time interval on a cart that is initially at rest on an air track. This force gives the cart a certain final speed. The same force is exerted for the same length of time on another cart, also initially at rest, that has twice the mass of the first one. The final speed of the heavier cart is

air track   F
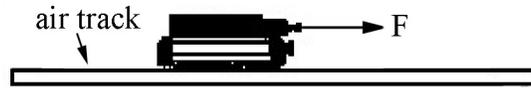
1. one-fourth
2. four times
3. half
4. double
5. the same as

that of the lighter cart.

Question 9 A cart on a roller coaster rolls down the track shown below. As the cart rolls beyond the point shown, what happens to the components of the velocity and acceleration in the direction of motion? Briefly explain your answer.
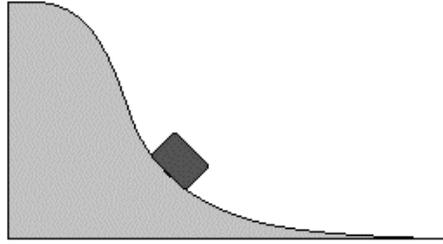
   a) Both decrease;
   b) The speed decreases, but the acceleration increases;
   c) Both remain constant;
   d) The speed increases, but acceleration decreases;
   e) Both increase;
   f) Some other combination.

Briefly explain your answer.

Question 10 A body of mass m is suspended from a spring with spring constant k in configuration (i) and the spring is stretched a distance x. If two identical bodies of mass $m/2$ are suspended from a spring with the same spring constant k in configuration (ii), how much will the spring stretch?


(i)   (ii)
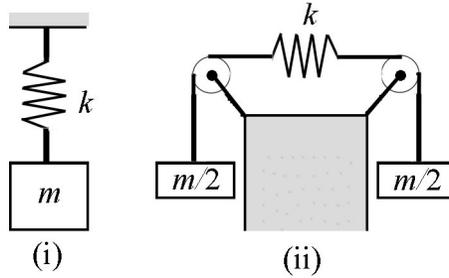
a) x
b) $2x$
c) $x/2$
d) $x/4$
e) not stretch at all.

Question 11

In the situation below, a person pulls a string attached to block A, which is in turn attached to another, heavier block B via a second string. Assume the strings are massless and inextensible; and ignore friction. Is the magnitude of the acceleration of block A

a) greater than the magnitude of the acceleration of block B?
b) equal to the magnitude of the acceleration of block B?
c) less than the magnitude of the acceleration of block B?
d) Do not have enough information to decide.

frictionless

B   string 1   A   string 2   **F**
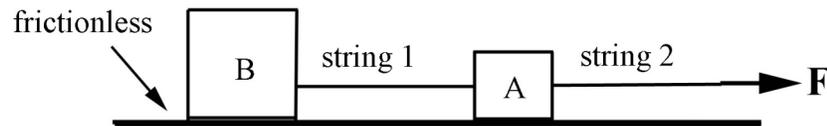
8.01SC Physics I: Classical Mechanics