

Newton's Laws Pre-Test

1.) Consider the following two statements and then select the option below that is correct. (i) It is possible for an object move in the absence of forces acting on the object. (ii) It is possible to have forces on an object in the absence of motion of the object.

- a. The first statement is the only correct one.
- b. The second statement is the only correct one.
- c. Both statements are correct.
- d. Neither statement is correct.

2.) An object moves with a constant velocity. Which of the following cannot be true for the object?

- a. No forces act on the object.
- b. A single force acts on the object.
- c. Two forces act on the object.
- d. Three forces act on the object.

3.) An object accelerates when it experiences a non-zero net force. Which of the following statements is *always* true?

- a. The object moves in the direction of the net force.
- b. The object's velocity is in the same direction as its acceleration.
- c. The object's acceleration is in the same direction as the net force that acts upon it.
- d. The object's velocity increases.

4.) You push an object, initially at rest, across a frictionless floor with a constant force for a time interval, t , which results in a final speed of v for the object. You repeat the experiment, but with a force that is half as large. What time interval is now required to reach the same final speed?

- a. $2t$
- b. t
- c. $t/2$
- d. $4t$

5.) A model rocket of mass, m , is fired upward from a launch pad with some initial speed, v . A gravitational force is exerted on the rocket:

- a. at no points in its motion.
- b. at all points in its motion.
- c. at all points in its motion except at its highest point.
- d. at none of these choices.

6.) Which amount would be of greater value?

- a. A newton of gold weighed on the Earth.
- b. A newton of gold weighed on the Moon.
- c. They would be of the same value, since a newton is a newton.
- d. We need more information to tell.

7.) A race car moving quickly around a track collides with a mosquito, which splatters on the car's windshield. Which object experiences a greater magnitude impact force?

- a. the race car
- b. the mosquito
- c. Both experience the same force.
- d. One cannot tell, you need to know the speeds of the mosquito and the race car.

8.) A race car moving quickly around a track collides with a mosquito, which splatters on the car's windshield. Which object experiences a greater magnitude acceleration?

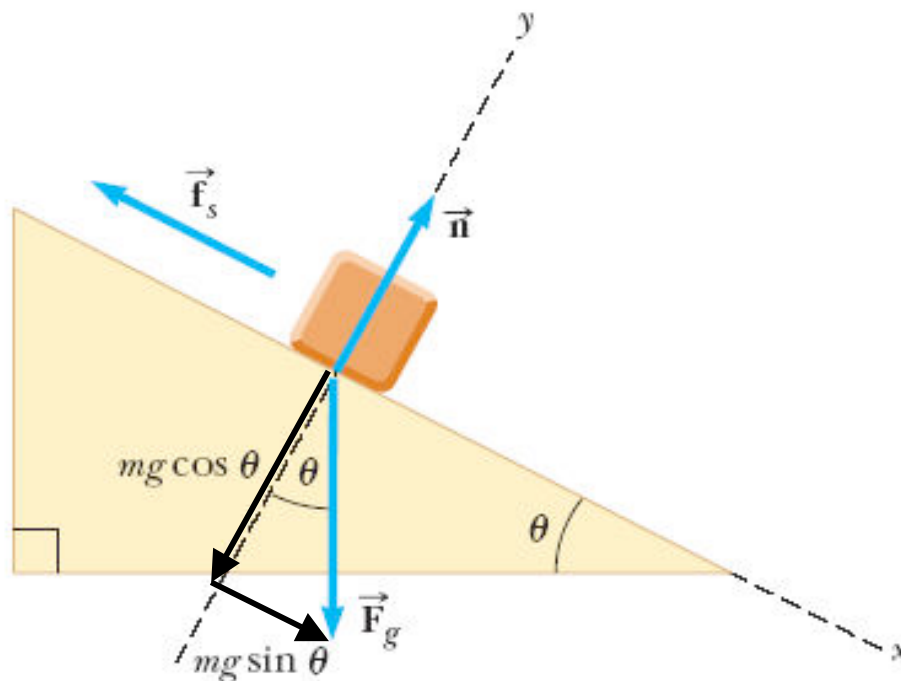
- a. the race car
- b. the mosquito
- c. Both experience the same acceleration.
- d. One cannot tell, you need to know the speeds of the mosquito and the race car.

9.) When you sit in a chair there is necessarily a reaction force to the gravitational force acting on your body. Which of the following best describes this reaction force?

- a. the normal force exerted by the chair onto you
- b. the force of gravity you exert on the earth
- c. the force you exert downward on the seat of the chair
- d. none of these forces

10.) When you draw the free-body diagram for a single object, you must sketch:

- a. only those forces that the single object exerts on other objects.
- b. the forces that act on the single object along with any resulting accelerations that the object experiences.
- c. the forces that act on the object and the forces that the object exerts on other objects.
- d. only the forces that act on the object.



11.) A block of mass m is resting on a ramp making an angle θ with respect to the horizontal. The coefficient of static friction and the coefficient of kinetic friction for this surface are μ_s and μ_k . If the block does not slide, then the frictional force holding the block must be:

- a. $\mu_k mg \cos \theta$.
- b. $\mu_s mg \cos \theta$.

- c. $\mu_s mg \sin \theta$.
- d. not given in these choices.

12.) A heavy box is located in the center of the cargo hold of a train. There are no other boxes or items in the cargo hold and there are no straps holding the box down. The train accelerates along the track in the northward direction. The direction of the friction force exerted by the floor of the cargo hold on the box is:

- a. to the north.
- b. to the south.
- c. upward.
- d. none; no friction force exists because the box is not sliding.

13.) You place a box on a smooth and evenly sanded wooden board. Raise one end of the board so that the angle increases. Eventually, the box starts to slide along the board. If you maintain this angle of the board, the box:

- a. will slow down and stop along the ramp.
- b. will speed up along the ramp.
- c. will move at constant speed along the ramp.
- d. will do none of these.

14.) Suppose you were to help slide someone across the snow in a sled on a flat, horizontal field and that you had two choices of how to move him. One choice is to push downward at an angle of 30° below the horizontal and the other is to pull with a rope such that the rope makes an angle of 30° above the horizontal. In which case would you need to use the greater force?

- a. You would need to use a greater force if you were to push at an angle of 30° below the horizontal.
- b. You would need to use a greater force if you were to pull with a rope at an angle of 30° above the horizontal.
- c. In both cases you would need to use the same amount of force.
- d. You cannot tell from the information given.

15.) In which case is the tension force in the rope greatest? Assume the same two people for each case.

- a. Two equally matched people play tug of war, one on each end of a rope,

each pulling on the rope as hard as they can.

b. A rope is tied at one end to a tree and the same two people are on the other end, each pulling the rope as hard as they can.

c. The tension force is the same in both cases.

d. It is impossible to tell. More information is required.

Solutions: c, b, c, a, b, b, c, b, b, d, b, a, b, a, b.