

Newton's third law: multiple choice

For each of the following questions/statements choose the best option.

1. Whenever object A exerts a force on object B, object B exerts a force of the same magnitude on object A, but in the opposite direction. Is this statement
 - a) always true?
 - b) sometimes true?
 - c) never true?

2. A woman of mass 50 kg sits on the floor. Assuming that there are no other external forces acting, she exerts a force on the floor of
 - a) 50 N
 - b) 50g N
 - c) 5g N
 - d) 5 N

3. A woman of mass 50 kg sits on the floor. Assuming that there are no other external forces acting, the floor exerts a force on her of
 - a) 50 N
 - b) 50g N
 - c) 5g N
 - d) 5 N

4. Martyn catches a cricket ball. Consider the action force to be the contact of the ball against Martyn's glove. What is the reaction to this force?
 - a) Martyn's grip on the glove
 - b) The force the glove exerts on the ball
 - c) Friction caused by the ground against Martyn's shoes
 - d) The muscular effort in Martyn's hand
 - e) None of the above

5. Jan hits a nail with a hammer. During the collision, there is a force
- on the hammer but not on the nail
 - on the nail but not on the hammer
 - on the nail and also on the hammer
6. As a ball falls, the action force is the gravitational pull of the Earth's mass on the ball. What is the reaction to this force?
- Air resistance acting against the ball
 - The acceleration of the ball
 - The gravitational pull of the ball on the Earth
 - Non-existent in this case
 - None of the above
7. An unfortunate mosquito splatters against the windscreen of a moving car. Compared to the force of the car on the mosquito, the magnitude of the force of the mosquito on the car is
- larger
 - smaller
 - the same
 - More information needed
8. At the instant that the unfortunate mosquito splatters against the windscreen of the moving car, how does the deceleration of the car compare to the deceleration of the mosquito?
- The car experiences a greater deceleration
 - The car experiences a smaller deceleration
 - The car experiences the same deceleration
 - More information needed
9. According to Newton's third law, if you push gently on something, it will push
- gently on you
 - gently on something else
 - gently on something only under the right conditions
 - gently on you, but only if you aren't moving
10. Ben and Geri play tug-of-war with a long rope. At one point Ben is winning and accelerating backwards. At this moment, the magnitude of the tension force on Ben is
- greater than the magnitude of the tension force on Geri
 - less than the magnitude of the tension force on Geri
 - equal in magnitude to the tension force on Geri
 - More information needed

Answers

1. A – This is simply a way of stating Newton's third law.
2. B – Using Newton's second law.
3. B – The answer would be the same as for question 2.
4. B – The interaction here is between the glove and the ball.
5. C
6. C – If the ball is 'object A' then the Earth is 'object B'.
7. C
8. B – The force on each object is of the same magnitude, so the object of greater mass (the car) will have a smaller acceleration (Newton's second law).
9. A – It *might* push on something else, but this is not a direct consequence of Newton's third law.
10. C – The tension is constant throughout the rope. The acceleration can be explained by other forces, such as an imbalance in the friction forces acting on Ben and Geri.