Name _____ Period _____ Date _____

Newton's Second Law of Motion

Pre-Test - Post-Test

1. The acceleration produced by a net force on an object is _____.

A) in the same direction as the net force.
B) inversely proportional to the mass of the object.
C) directly proportional to the magnitude of the net force.
D) all of the above
E) none of the above

2. If the force acting on a cart doubles, what happens to the cart's acceleration?

A) It halves.
B) It stays the same.
C) It doubles.
D) It quadruples.

3. A push on a 1-kilogram brick accelerates the brick. Neglecting friction, to equally accelerate a 10-kilogram brick, one would have to push _____.

A) with 100 times as much force.
B) with one tenth the amount of force.
C) with 10 times as much force.
D) with just as much force.

4. A force of 100 N accelerates a mass of 1 kg at the rate of 1 meter per second squared. The acceleration of a mass of 2 kg acted upon by a force of 2 N is

A) the same.
B) twice as much
C) half as much.
D) none of the above.

5. A rock is thrown vertically into the air. At the very top of its trajectory the net force on it is _____.

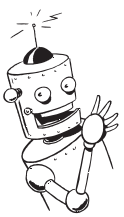
A) its weight.
B) less than its weight.
C) more than its weight.

6. Suppose a particle is accelerated through space by a constant 10-N force. Suddenly the particle encounters a second force of 10-N in a direction opposite to that of the first force. The particle _____.

A) continues at the speed it had when it encountered the second force.
B) theoretically accelerates to speeds approaching the speed of light.
C) gradually decelerates to a halt.
D) is brought to a rapid halt.

7. A heavy rock and a light rock are in free fall and have the same acceleration. The reason they have the same acceleration is because the _____.

A) force of gravity is the same on each.
B) air resistance is zero in free fall.
C) inertia of both rocks is the same.
D) ratio of force to mass is the same.



Name _____ Period _____ Date _____

Newton's Second Law of Motion

Force Causes Acceleration

"The acceleration of an object is directly proportional to the net force acting on the object, is in the direction of the net force, and is inversely proportional to the mass of the object."

1. What is the acceleration of a moving object that has no net force acting on the object?

2. You are on a plane and flipping a coin in the air while in your seat.

a) If the plane is traveling at a constant velocity and you flip a coin in the air, where does it land?

b) If the plane is accelerating down a runway and you flip a coin in the air, where does it land?

c) If the plane is decelerating while landing and you flip a coin in the air, where does it land?

3. What causes an object to accelerate?

4. What is the relationship between an object's acceleration and the net force acting on it.

Mass Resists Acceleration

5. What causes objects to resist acceleration?

6. How does an increase in mass affect acceleration?

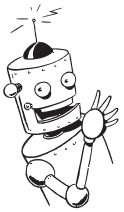
7. What is the relationship between an object's mass and its acceleration?

Newton's Second Law

8. Write Newton's second law of motion mathematically.

9. Two darts are shot horizontally from a gun with the same force, one dart has three times the mass as the other, which dart goes the furthest?

10. Two darts are shot vertically towards the ground from a gun with the same force, one dart has three times the mass as the other, which dart hits the ground first?



11. If the net force acting on a sliding block is tripled and the mass is kept the same, what happens to the acceleration?

12. If the mass of a sliding block is tripled and the net force is kept the same, what happens to the acceleration?

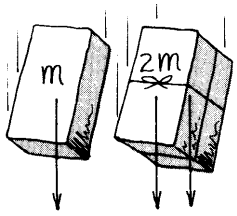
13. A rocket's acceleration increases as it travels through space even though the force remains constant, explain.

14. When you leap upward in a standing jump, how does the force that you exert on the ground compare to your weight?

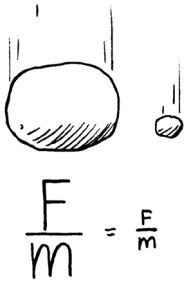
Free Fall Explained

15. Why did Galileo struggle to convince people that objects of varying mass all fall at the same rate?

16. In the absence of air resistance, all objects fall at the same rate. Using Newton's second law, explain.



17. The ratio of circumference/diameter for all circles is π. What is the ratio of force/mass for all freely-falling bodies?

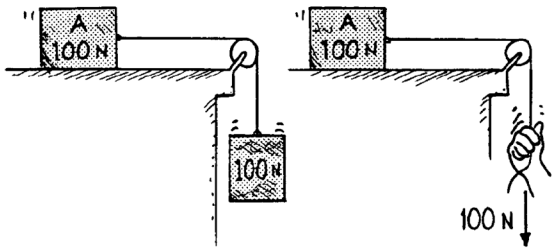


18. Why doesn't a heavy object accelerate more than a light object when both are freely falling?

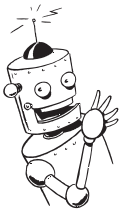
19. Aristotle believed that an object that weighed 10 times as much as another would fall 10 times faster, what did Aristotle fail to understand?

20. As a young kid, Doc Fizzix noticed that the cars of a roller coaster never collide even when they are loaded with varying sized people, explain.

21. In both cases an applied force of 100 N accelerates the 100-N block.

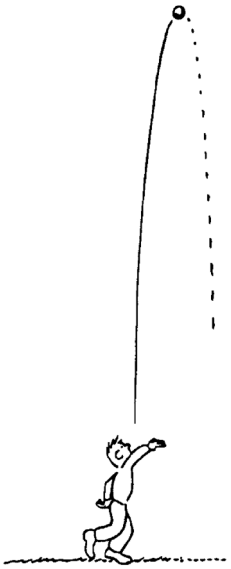


a) In which case is the acceleration greater? Explain



Chapter 5 Newton's Second Law of Motion

22. A 1 kg rock is thrown straight upwards into the air.



b) What will be the net force acting on the rock at the tippity-top of its path?

c) What will be the acceleration of the rock at the tippity-top of its trajectory?