

Name: KEY

Newton's Laws of Motion Quiz Review KEY

1. Newton's first law of motion states : (**sometimes referred to as the law of inertia**). **An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force.**
2. Newton's second law of motion states : **The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object. However, the Second Law gives us an exact relationship between force, mass, and acceleration. It can be expressed as a mathematical equation: FORCE = MASS times ACCELERATION**
3. Newton's third law of motion states : **_For every action there is an equal and opposite re-action. This means that for every action there is a reaction force that is equal in size, but opposite in direction. That is to say that whenever an object pushes another object it gets pushed back in the opposite direction equally hard**

Instructions: Each of the items below is best represented by one of the Newton's Laws of Motion. Write a 1, 2 or 3 for each of the following to indicate whether it's Newton's 1st, 2nd or 3rd law.

4. 3 A climber pulls down on a rope causing his body to lift upward and rise along the rope.
5. 2 Force= Mass x Acceleration
6. 3 Two bumper cars collide into each other and each car jolts backwards
7. 2 When you give your friend a lift on your bike you have to pedal harder and faster to keep the same speed (acceleration) as you had when you were on your bike alone
8. 3 For every action there is an equal and opposite reaction.
9. 2 A smaller cannon ball leaves a cannon much faster than a larger, heavier cannon ball fired at the same time.
10. 1 When you are standing in a subway train and the train suddenly stops but your body continues to move forward.
11. 2 It is much easier to carry your backpack when it is empty rather than when it's full of textbooks.
12. 1 A boy is going down a slide. As he reaches the bottom, friction causes him to slow down and stop.
13. What is inertia? **Objects tend to "keep on doing what they're doing." In fact, it is the natural tendency of objects to resist changes in their state of motion. This tendency of an object to resist changes in their motion is described as inertia.**

14. Describe how mass and inertia are related. **The more the mass the more the inertia**

15. How does mass effect acceleration? **A smaller mass accelerates faster than larger mass.**

16. Kg measures mass

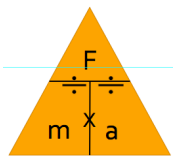
18. M/s² measures acceleration

17. N measures Force

19. 1N= **1kg *m/S²**

20. The acceleration due to gravity is 9.9m/ S².

21. What are the three formulas which describe the relationship between mass, force and acceleration?



Here is a way to remember the formula $F=ma$, $m=F/a$, $a=F/m$.

22. A force of 52 N acts upon a 4 kg block sitting on the ground. Calculate the acceleration of the object.

$$a=F/m =52/4\text{kg}=13 \text{ m/S}^2$$

23. A 5 kg block is pulled across a table by a force of 61 N. Calculate the acceleration of the object.

$$a=F/m = 61\text{N}/5\text{kg}= 12.2 \text{ m/S}^2$$

24. A roller coaster pushes a 25 kg person upward with a force of 300 N. What is the acceleration?

$$a=F/m = 300\text{N} /25\text{kg}=12 \text{ m/S}^2$$

25. An object of mass 10 kg is accelerated upward at 2 m/s². What force is required?

$$F=ma=10\text{kg} \times 2 \text{ m/s}^2 = 20\text{N}$$

26. What is the mass of an object if a force of 17 N causes it to accelerate at 1.5 m/s²?

$$m=F/a = 17 \text{ N}/1.5 \text{ m/s}^2 =11.3 \text{ Kg}$$

27. What is the acceleration of a 10 kg object if a force of 3 N is applied to it?

$$a=F/m=3 \text{ N} \times 10 \text{ kg}= 30 \text{ m/s}^2$$

28. What is the mass of an object that requires a force of 25 N to accelerate at 5 m/s/s?

$$m = F/a = 25 \text{ N} / 5 \text{ m/s}^2 = 5 \text{ kg}$$

29. How much force is required to accelerate an 1,800 kg truck at 3 m/s/s?

$$F = ma = 1,800 \text{ kg} \times 3 \text{ m/s}^2 = 5,400 \text{ N}$$

30. What is the mass of a falling rock if it produces a force of 147 N?

The acceleration due to gravity is 9.8 m/s^2 .

$$m = F/a = 147 \text{ N} / 9.8 \text{ m/s}^2 = 15 \text{ kg}$$