

Name: **KEY**  
Date: **KEY**

Teacher: **KEY**  
Period: **KEY**

## NEWTON'S LAWS WORKSHEET - KEY

### I. NEWTON'S FIRST LAW OF MOTION

- Newton's first law of motion is also known as the LAW OF **INERTIA**
- Newton's first law says that
  - an object that IS NOT MOVING, or is at **AT REST** will stay at **AT REST AND**
  - an object that IS MOVING will keep moving with constant **VELOCITY** which means at the same **SPEED** and in the same **DISTANCE UNLESS**
  - an **OUTSIDE** force acts on that object.
- What is inertia?  
**The resistance of any physical object to any change in its state of motion**
- What property of an object determines how much inertia it has?  
**Mass**
- Which of the following has more inertia?
  - Bowling ball** or Tennis ball
  - Hammer** or Feather
- When traveling in a car and turning to the right, which way does your body go and why?

**Imagine that you are a passenger in a car which is making a right-hand turn. As the car begins to take the turn to the right, you often feel as though you are sliding to the left. The car is turning to the right due to the inward force, yet you feel as though you are being forced leftward or outward. In actuality, the car is beginning its turning motion (to the right) while you continue in a straight line path.**

### II. NEWTON'S SECOND LAW OF MOTION

- Newton's second law of motion is also known as the LAW OF **ACCELERATION**
- Newton's second law says that when an **UNBALANCED** force is applied to a **MASS (OBJECT)**, it causes it to **ACCELERATE.**
- The greater the force that is applied, the **GREATER** the acceleration.
- The lesser the force that is applied, the **LESSER** the acceleration.
- If the same force is applied to an object with a large mass, it will have a **LESSER** acceleration.
- If the same force is applied to an object with a small mass, it will have a **GREATER** acceleration.
- The equation that is used to solve second law problems is  **$F = ma$** .
  - What does each of the variables mean?  
F = **FORCE**      m = **MASS**      a = **ACCELERATION**
  - What **unit** of measurement must be used with each variable?  
F = **kg·m/s<sup>2</sup> (N - Newton)**      m = **kg**      a = **m/s<sup>2</sup>**

### III. NEWTON'S THIRD LAW OF MOTION

14. Newton's third law of motion is also known as the LAW OF **ACTION – REACTION.**
15. Newton's third law says that every time there is an **ACTION** force, there is also a **REACTION** force that is **EQUAL** in size and acts in the **OPPOSITE** direction.
16. Newton's third law states that forces must ALWAYS occur in **PAIRS.**
17. Listed below are ACTION forces. **Tell the REACTION force.**
- Your bottom pushing on your desk seat: **SEAT PUSHING UP ON YOUR BOTTOM**
  - A bat hitting a baseball: **BASEBALL HITTING THE BAT**
  - Your finger pressing on your phone screen while texting: **PHONE SCREEN PUSHING BACK ON YOUR FINGER**
18. What is friction?
- The resistance FORCE that one surface or object encounters when moving over another; slowing or preventing an object's motion between two surfaces.**
19. List the four types of friction.
- STATIC** friction: **FRICTION AT REST**
  - SLIDING** friction: **FRICTION AS SURFACES SLIDE ACROSS EACH OTHER**
  - ROLLING** friction: **USE OF WHEELS, CYLANDERS, BALL BEARINGS, ETC.**
  - FLUID** friction: **FRICTION INVOLVING LIQUIDS OR GASES**
20. Friction that occurs in gases and liquids is called **FLUID** friction.
21. **True** or False: Static friction prevents you from slipping when you walk on a sidewalk.
22. True or **False**: Sliding friction is stronger than static friction.
23. You use **SLIDING** friction when you leave marks on paper with a pencil "lead."
24. The weakest type of friction that occurs between solid surfaces is **ROLLING** friction.
25. Factors that affect the amount of friction against an object are **MASS** and **ROUGHNESS OF SURFACE**
26. When you put on the brakes of your bike, the wheels stop turning. Friction between the wheels and the road slows your bike to a stop. Which type of friction is this?
- fluid friction
  - static friction
  - sliding friction**
  - rolling friction
27. The factors that affect gravitational pull on an object are **MASS** and **DISTANCE**
28. Define mass:
- The amount of matter (substance) an object possess. Measured in kg. Mass tells you how many particles you have.**
29. Define weight:
- The measure of the gravitational force pulling on a mass. Measured in Newtons OR pounds (NOT kg). Weight (w)= mass (m) X acceleration due to gravity (g):  $F_w = m \times g$ .**

30. What is acceleration due to gravity constant? Include units. (numeric value) **9.8 m/s<sup>2</sup>**

**Gravity is a force (pull) of attraction between masses. Measured in Newtons.**

31. A) What would you observe if you drop a cotton ball and a rock at the same time? B) Would it be different if you did the same occur if performed in a vacuum tube? Explain your answer.

**A) In Earth's atmosphere, the cotton ball would hit the ground after the rock due to air friction.**

**B) In a vacuum, the air is removed so the rock and cotton ball would fall at the same rate (9.8 m/s<sup>2</sup>).**

32. **True** or False: Your mass would be the same on the Moon as it is on the Earth. Explain your answer in complete sentences.

**The amount of matter (substance) you possess will never change. Mass tells you how many particles you have.**

33. True or **False**: Your weight would be the same on the Moon as it is on the Earth. Explain your answer in complete sentences.

**REMEMBER: Weight is the measure of the gravitational force pulling on a mass. Due to the difference in gravitational pull, the weight will be less on the moon than on Earth due to the mass of the moon being less than that of the Earth.**

34. What happens to the gravitational pull between two bodies when the distance between them increases? **Gravitational pull decreases as distance increases. Think of the attraction between magnets in relation to distance apart.**

#### IV. UNDERSTANDING.....

Label each of the following images/descriptions below as being examples of 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> law. Then EXPLAIN your answer!



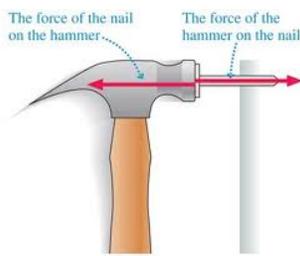
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$$F=m \cdot a$$
$$20\text{N}=5\text{kg} \cdot a$$
$$a=4\text{m/s}^2$$

1<sup>st</sup> law   **2<sup>nd</sup> law**   3<sup>rd</sup> law

Explanation:

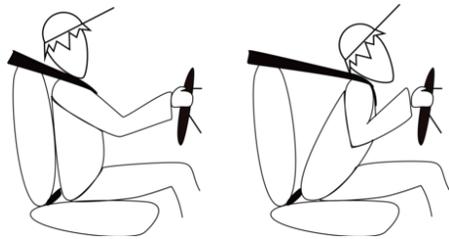
**A 20 N force is being applied to a 5kg mass. The resulting calculation is acceleration. F=ma**



1<sup>st</sup> law   2<sup>nd</sup> law   **3<sup>rd</sup> law**

Explanation:

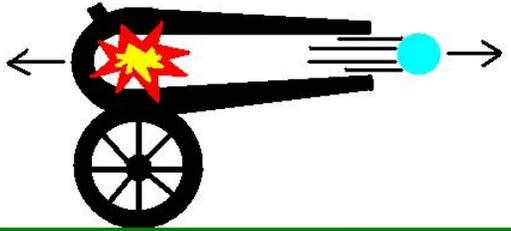
**Diagram labels action & reaction forces between the hammer and the nail.**



1<sup>st</sup> law   2<sup>nd</sup> law   3<sup>rd</sup> law

Explanation:

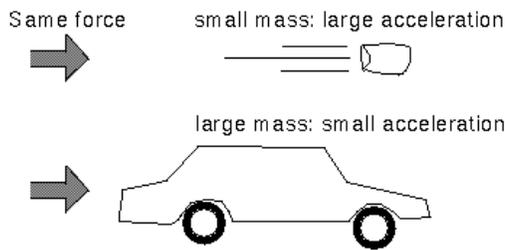
The person would continue moving forward if the outside force of the seatbelt didn't stop him.



1<sup>st</sup> law   2<sup>nd</sup> law   3<sup>rd</sup> law

Explanation:

The action & reaction forces between the cannonball and the cannon displayed.

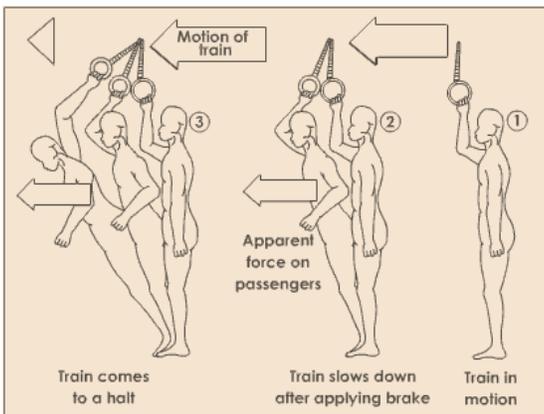


1<sup>st</sup> law   2<sup>nd</sup> law   3<sup>rd</sup> law

Explanation:

Shows the relationship between mass & acceleration when a force is applied.

**Force = mass x acceleration**



1<sup>st</sup> law   2<sup>nd</sup> law   3<sup>rd</sup> law

Explanation:

Shows the person wants to stay in motion as the train slows down. (Refer to arrows above figures)